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Contents

Contents	Page
An exceptional influx of the Diamond-back Moth in Yorkshire in the spring of 2016 H. E. Beaumont and C. H. Fletcher	1
Homage to Lloyd: revisiting a pioneering biogeographical paper in *The Naturalist* * Robert A.D. Cameron	4
Field Note: The Lealholm Proboscidean tooth Chris Pellant	12
Freshwater plants and SSSI canals in the East Midlands and North of England 2: Chesterfield Canal, Cromford Canal and Grantham Canal R. Goulder	15
The bats of Rockley Tramway Tunnel* Peter Middleton and Robert A. Bell	33
***Calomicrus circumfusus* (Coleoptera: Chrysomelidae) in Yorkshire - a correction** R.J. Marsh	40
Gains and losses of species abundances of bees of Watsonian Yorkshire Michael Archer	41
Field Note: Drone Fly impaled on thistle Richard Shillaker	48
Species-rich neutral grassland management on roadside verges in Burley-in-Wharfedale, West Yorkshire Robyn Guppy, Karl Harrison, Gordon B. Haycock	50
The Mollusca of some ancient semi-natural woodlands in coastal N.E. Yorkshire* A. A. Wardhaugh	54
Yorkshire Ichneumons: Part 6 W.A.Ely	60
Excursion Circulars 2017	69
Book reviews	77
Calendar	80

Notices: p14 YNU AGM 2017
p32 Staff changes

Erratum: p60

An asterisk* indicates a peer-reviewed paper

Front cover: Lealholm Proboscidean tooth (see p12) Photo: *Chris Pellant*

Back cover: YNU members Jill Warwick and Mike Denton talking to visitors to the YNU stand at the BTO Conference at the University of York, 18 March 2017.

Yorkshire Naturalists' Union

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The Naturalist

An exceptional influx of the Diamond-back Moth in Yorkshire in the spring of 2016

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For many Yorkshire lepidopterists the first indication of a sudden arrival of large numbers of the Diamond-back Moth *Plutella xylostella* (Linnaeus) came from the BBC natural history programme Springwatch transmitted from the RSPB reserve at Minsmere, Suffolk on 31 May, 2016, when considerable numbers were attracted to a mercury vapour moth trap operated at the site. Almost immediately this moth was recorded widely across the country, including Yorkshire, and the phenomenon attracted widespread publicity in the national media, where the emphasis was on the damage and economic repercussions that the moths could have on *Brassica* crops.

The Diamond-back Moth (see Plate 1, centre pages) is a well-known immigrant and potential pest, perhaps originating in Asia Minor but which has been spread around the world by human activity and now occurs on every continent except Antarctica. It is recorded annually in varying numbers across Yorkshire and, although widespread, the totals involved are usually unremarkable. Periodically, however, it appears in numbers so great that the presence of the moth becomes apparent to the wider public. The major influxes of this species seem to come from northern Europe and are thus most evident in north and eastern England and in eastern Scotland.

The 2016 influx was sudden and unexpected. The first hint was the arrival of unusual numbers in eastern and northerly parts of Yorkshire on 30 May. By the following day there were reports from all across the county and over the next few days numbers rapidly increased to record levels. Social media was buzzing with reports of huge counts. On 31 May Ian Marshall estimated 1250 in a single MV trap in North Ferriby and the following day Lenora Bruce reported 800 to a single actinic trap at Bridlington. On 2 June Jim Morgan, whilst walking across an area of damp long grass in Hornsea Town Park, flushed "clouds of Diamond-back with every step" - a conservative estimate was made of at least 4000 individuals. On 3 June Andy Hood reported over 3000 in one small area of Filey with similar numbers at Flamborough the

following day. By 5 June the same observer estimated 20,000 in a single field at Flamborough and the same day Damian Money reported 1800 to light at Skinningrove and 1500 at Brotton. Although the largest numbers were seen in coastal areas, there were some impressive counts inland. Dave Hunton in Garforth noted on 8 June “this morning was the first time in over twenty years that I have seen anything like the number of moths in my trap; admittedly 90% were Diamond-back Moths! What an incredible sight. I've logged 1000 but this was a conservative figure”. Numbers peaked in the first week of June then gradually declined, with 350 at Saltburn on 21 June (Damian Money) being the last big count. A smaller second peak of records occurred from late July, especially in the north-east of the county, with 350 by day at Fen Bog (Ian Marshall) on 24 July, 195 at Skelton (Damian Money) on 2 August and 171 at the same site on 6 August. These were presumably the progeny of the original migrants. After this numbers fell dramatically to normal levels with the last double-figure count of 14 at North Ferriby on 22 August and the last individual at West Melton on 1 November.

The mass migration was not confined to Yorkshire and similar numbers were reported all across the country. On 7 June it was widely reported in the media that “a two-mile cloud of moths reported in Leominster...was like driving through rain”. The national press was not to be left out, particularly in view of the referendum on Brexit due on 23 June. *The Sun* led the way with “Nasty Euro Moths hit UK” and “Time to Mothball the EU” on the front page of its 15 June edition; the inside pages urging the public to vote Leave in order to “protect our country...and our cabbages”. The newspapers were seemingly unaware of the fact that the influx occurred during a period of north-easterly winds so the moths probably originated from parts of the Baltic region outside the EU! It was widely predicted that *Brassica* farmers would be badly affected and there was much media speculation that Brussels sprouts would be in short supply at Christmas. Again *The Sun* led the way with “Christmas dinners under threat as plague of Brussels sprout-eating moths invade UK”. *The Daily Telegraph* countered with “Brussels sprouts could be off the menu this year as the crop could be ruined by a plague of immigrant moths invading the UK” but then misleadingly stated that the moth in question was known as “Cabbage Moth”. By late summer, however, numbers of Diamond-back Moths had fallen to levels seen in an average year and fortunately (or unfortunately depending on your point of view) Christmas dinners did not appear to be significantly affected by a lack of sprouts.

There were many articles in the media forecasting that crop damage was going to be bad but very few supported that these predictions had come true. An article in *Lincolnshire Live* entitled “Moth invasion wipes out 60% of Lincolnshire's sprout supplies” was misleading as the quote from the farmer was “We've actually had one field where we have thrown away about 60 per cent of the crop” so the damage overall will have been less. A “DEFRA spokesman” was reported in the *Daily Express* as saying “while the number observed this year is particularly high, there has been no significant damage reported in crops and a number of control methods are available for farmers” – which was rather glossing over the fact that control methods are poor. The moth seems to become quickly resistant to commonly used pesticides, in fact samples of Diamond-back Moths from Lincolnshire, Suffolk and Scotland were tested at Rothamsted Research and all were found to be resistant to pyrethroids. So, to sum up, despite resistance to some commonly used pesticides, in most cases damage was much less than predicted.

The most severe recent outbreaks occurred in the years 1891, 1914 and 1958. Agassiz (1996) mentions a "great immigration in 1891 that whole fields of crops were destroyed in Lincolnshire". Arkle (1891) has a lovely story of how Mr. A.H. Paynter visited the Longstone Lighthouse (Farne Islands) on 10 July to find the surrounding rocks covered in moths and that the lighthouse keepers told him that they had to keep sweeping them off the light throughout the night so that it could be seen by passing shipping.

Although Chu (1986) cites 1914 as a year when there was a large immigration of Diamond-back Moths into Britain, they seem to have been largely ignored by Yorkshire lepidopterists. The recent onset of the Great War perhaps deflected interest and observer effort. In fact the only mention traced is by T.A. Lofthouse when reporting on the YNU excursion to Eskdale in early August, who states "There were also a few *Plutella cruciferarum*, the 'pest' of the season about."

A major outbreak of the species in 1958 saw spectacular numbers in northeast coastal towns from Berwick to Scarborough that caused chaos. Mackenzie (1958) reported that the moths entered houses in such numbers as to cause alarm, cyclists were forced to ride through swarms, and car drivers had to stop and clean their windscreens.

Unfortunately at that period interest in the smaller moths in Yorkshire was almost non-existent and local information was derived from only a handful of observers. Frank Hewson, the YNU Lepidoptera recorder at that time, relates in his annual report for 1958 that during May many were reported right across the north of England but that myriads were yet to come. R.S. Pollard (the Scarborough Naturalists' Society moth recorder) wrote that on 2 June there occurred an incredible invasion of *Plutella maculipennis* (as the moth was then known) as far south as Withernsea with literally millions in both town and country. Several local farmers who omitted to spray lost all their swedes and kale. J. Briggs reported that on the morning of 30 June the moth made a sudden appearance with about thirty in his moth trap at Bradford. Towards the end of July and early in August considerable damage was done to *Brassica* plants and wallflowers by the larvae, of which seven or eight could be found on one cabbage leaf. He went on to say that the expected second brood did not appear and only occasional moths turned up in the trap subsequently. Further south J.H. Seago first noticed moths flying in his garden at Wath-on-Dearne in misty rain early in the morning of 3 July. By midday large numbers were at rest on bushes and plants and at each tap of the foliage a hundred or so would fly out; the garden must have contained several thousands of moths. By the following morning numbers had greatly reduced and only half a dozen could be found.

It could perhaps be said that, although the 2016 influx was dramatic, it was by no means unprecedented and numbers in the past may have been even greater. One thing which possibly sets the 2016 event apart from minor influxes over the last 20 years is that there are often several small immigrations per year but this year it was just one huge influx and almost nothing afterwards. Most later season records were likely to have been due to second (and subsequent) generations but numbers seemed to be much fewer than would normally be expected and there was little evidence of further invasion. In that respect it was rather reminiscent of the 1958 influx.

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Homage to Lloyd: revisiting a pioneering biogeographical paper in *The Naturalist*

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Introduction

Following a long-standing tradition, Lewis Lloyd-Evans ("Lloyd") published his 1974 Presidential Address to the YNU in *The Naturalist*: "The biogeography of snails in Yorkshire" (Lloyd-Evans, 1975). It is a short but wide-ranging account, dealing with many interesting records of land and freshwater molluscs in the county. It also includes a detailed account of his systematic sampling of tetrads (2km squares) within a single 10km square (Ordnance Survey 44:20, Penistone). Among other ways of analysing his data, he examined the relationship between the size of area and the number of species to be found in it, extending beyond the square to the then known fauna of increasing areas within Yorkshire and to the whole of Great Britain. Included in his analysis is a graph (his Figure 6) showing the relationship between the number of species of land and freshwater molluscs and the logarithms of the areas concerned. This kind of quantitative examination, species/area relationships (SARs hereafter) has a long history, but he was almost certainly unaware that his was the first attempt to do so for molluscs within a single land mass. These SARs have played a significant part in the development of biogeographical ideas (Rosenzweig, 1995) but the next attempts to analyse such SARs for continental as opposed to island molluscs did not appear until the end of the 20th century (Nekola and Smith, 1999; Cameron, 2002).

His paper was not only a pioneering venture in this field; with some modifications in analysis and with the addition of a few later records, many obtained by Lloyd himself, his data shed light on some of the factors that influence variation in species richness among areas of the same size and enable us to examine some of the problems that arise in interpreting these SARs. We can now compare his results with those obtained elsewhere. In this paper, I give the context in which SARs give us important clues to the factors governing the distribution of

animals and plants and then re-analyse Lloyd's data to explore some of the influences on land snail distribution at the scale he used.

Lloyd was a man with many interests and skills in natural history (Obituary: *The Naturalist*, 127 (2002): 81-83). At a time of 'big data' and very sophisticated professional analyses, I pay homage to systematic and informed amateur observation, motivated by curiosity.

Species/Area relationships (SARs)

Assuming that sampling is adequate we naturally expect that, as we extend the area in which we make records, so the number of species we find will increase, even though the rate at which that happens might depend on scale and on the kinds of animal or plant we are interested in. According to Rosenzweig (*loc. cit.*) the first attempt to look quantitatively at the way in which the number of species increased as the area considered got larger was carried out by H.C. Watson in 1859 on plants recorded in increasing areas from a part of Surrey to the whole of Great Britain. Over time, many more analyses have been carried out and the ways of expressing them have become standardised. The increase can be modelled as a power law: $S = cA^z$, where S is the number of species, A is the area and c and z are constants. In practice, most analyses of SARs are performed using the equivalent equation: $\log S = z \log A + \log c$. In this form, z is the slope of the relationship and log c is the intercept, the value of log S when log A is 0. To get a feel for what this means, a slope of 0.1 indicates that for a thousand-fold increase in area, the number of species has merely a twofold increase. A very large number of these SARs are now known; most have a slope considerably less than 1 (Rosenzweig, *loc. cit.*).

In a classic account, Rosenzweig (*loc. cit.*) distinguished four kinds of SAR. Three concerned increasing areas of a landmass in which the results for small areas were included in the larger (so the slope could never be negative). At very small scales relative to the mobility of the organism, the slopes were relatively steep. At intermediate scales, the slopes were very shallow, but at very large scales they again steepened, often to the extent that the number of species increased in direct proportion to the area. The fourth was rather different; it concerned the relationship between number of species and the areas of islands in an archipelago. Here, each island is considered separately (so, in principle, a negative slope is possible: a smaller island may have more species than a larger). The explanations for these patterns are considered later but they are recognised as being among the most general patterns that we can find in nature (Rosenzweig, *loc. cit.*; Whittaker & Triantis, 2012).

The area, the data and their analysis

Lloyd-Evans (*loc. cit.*) gave a detailed description of his chosen 10km square. He described it as nothing exceptional, containing no great rarities: "an oasis of pleasant, unspoilt countryside in a district scarred by industrial development". He chose it for its very ordinary character. The range of altitude is 70-360m asl (Fig. 1). The rocks are mainly sandstones of the Coal Measures and Millstone Grit, all of Carboniferous age. The lack of limestone makes it a relatively hostile environment for snails.

Within this square he sampled each tetrad (2km square) at roughly the same intensity, visiting each several times. He presented his data in the form of a table (his Figure 1), listing all the species found within the 10km square and showing in which tetrads each had been found. His

list included freshwater as well as terrestrial molluscs and he presented simple maps indicating the distribution of species among tetrads. To construct his SAR, he worked out the average number of species in areas of increasing size within the 10km square and extended the range by using data for larger areas within Yorkshire, Yorkshire itself and the whole of Great Britain. Following a number of other studies at the time, he plotted the actual number of species (not its logarithm) against the log of the area. His figure 6 shows a remarkably tight fit of points to a regression line, with a correlation coefficient of 0.99! He noted that the number of species found in each tetrad varied considerably and that freshwater ones were particularly frequent in tetrads containing substantial water bodies.

I used his original data in a more general paper on molluscan SARs in Britain (Cameron, *loc. cit.*). Shortly after his paper was published a small number of unpublished additional records were made, many by Lloyd himself. Adrian Norris has made these available to me, and they are included in what follows. The data used here thus differ slightly from those in Lloyd-Evans (*loc. cit.*) and Cameron (*loc. cit.*). As in 2002, I have considered only the land molluscs. Apart from the fact that Lloyd noticed the very uneven distribution of freshwater snails among tetrads, the restriction enables us to compare the results with others using land molluscs only. For the same comparative reason I have used the logarithms of both the number of species and area. As Rosenzweig (*loc. cit.*) remarks, the log/log plot is now the standard for nearly all SAR studies and one can compare slopes among them.

Beyond the average number of species in each tetrad ($4km^2$), Lloyd used the average for intermediate areas of $20km^2$ but did not say how he chose such areas or whether they overlapped. Of necessity, there is only one figure for the whole 10km square. It is worth noting here that 'average' is a rather slippery term. The average (i.e. mean) richness of all tetrads is in itself straightforward, though potentially misleading (see below), but the averages for larger areas within the 10km square are more problematic because if all possible sets of such areas are considered, even if restricted to squares of contiguous tetrads, there are overlaps in the areas concerned so that some tetrads will contribute more to the final estimate than others. I have estimated the mean richness of all possible sets of square intermediate areas (4 tetrads, $16km^2$; 9 tetrads, $36km^2$; 16 tetrads, $64km^2$), but I have also given the maximum and minimum species totals recorded for each size of square. Maximum figures have been used in some other analyses (Cameron, *loc. cit.*).

Lloyd sang the praises of the Ordnance Survey and used the 1:25,000 map to estimate the amount of cover provided by different habitats: woods, agricultural and urban. I have re-evaluated woodland cover, distinguishing between coniferous and deciduous woods, but for each tetrad separately, using a map roughly contemporaneous with his survey. I have also used data on the range of altitude within each tetrad and the proportion of land within it lying above 200m. Thus, the analysis can be taken beyond the estimation of an SAR to account for variation in the number of species in each tetrad. These analyses generally use ranks rather than actual values to avoid statistical pitfalls, using Spearman's ρ.

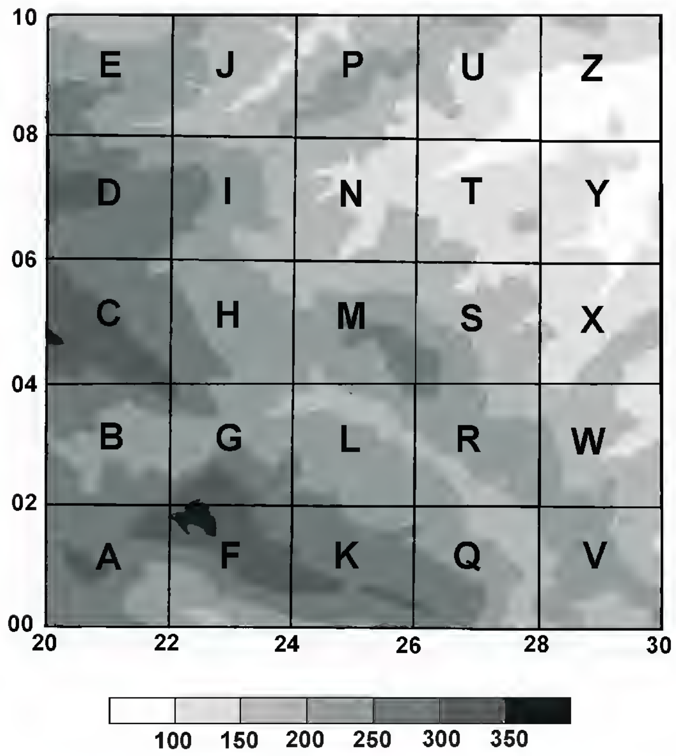

Fig. 1. A topographical map of Ordnance Survey square 44:20, Penistone, with the tetrads within it identified by letters as in Lloyd-Evans (1975). Shading is at 50m intervals.

Results

The topography of the square and the position of each tetrad are shown in Fig. 1, using the alphabetical system employed by Lloyd. Table 1 shows the species records and environmental details for each tetrad. Species are arranged in descending order of frequency. Names have been adjusted to conform to the latest British and Irish checklist (Anderson, 2008). 47 species have been recorded overall (13 slugs and 34 snails). The overall pattern, as noted by Lloyd, is one in which very frequent species (15, 32%, occurring in more than 80% of tetrads) and infrequent species (also 15, 32%, occurring in less than 20% of tetrads) outnumber those occurring in each of the intermediate 20% bands. Ten species occur in all the tetrads.

Table 1. The total number of mollusc species, the highest and lowest points, the percentage of land over 200m and the percentage occupied by deciduous woodland in each tetrad of the Penistone square. Note that a full version of this table, showing all mollusc species found in each tetrad, is available at http://www.ynu.org.uk/naturalist.

Tetrad	A	B	C	D	E	F	G	H	I	J	K	L
Species total	21	18	15	19	25	23	22	17	25	23	18	23
Highest point m	350	330	350	330	280	360	350	310	270	220	320	270
Lowest point m	210	210	230	200	180	190	190	170	160	150	230	180
% above 200 m	100	100	100	100	80	95	95	95	70	25	100	80
% deciduous woods	1.8	0.6	0.3	0.6	7.2	4.8	1.2	0.9	6.4	5.3	2.2	1.4

Tetrad	M	N	P	Q	R	S	T	U	V	W	X	Y	Z
Species total	23	33	27	22	29	28	24	27	26	24	33	28	28
Highest point m	270	190	240	300	260	270	180	215	250	230	190	150	170
Lowest point m	150	105	130	160	150	140	85	80	140	120	100	80	65
% above 200 m	70	0	20	70	65	25	0	10	55	20	0	0	0
% deciduous woods	3.2	7.1	11.3	4.2	7.1	11.2	9.2	15	7	10.5	20.5	5	13.2

Table 2. The means and ranges of numbers of slug and snail species recorded in areas of different sizes within the Penistone square, and the ratio of least to greatest richness overall. N is the number of square areas considered in each case.

Area Km^2	N	Mean slugs	Range slugs	Mean snails	Range snails	Mean all	Range all	Ratio
4	25	8.6	5-11	15.5	8-24	24.1	15-33	1:2.2
16	16	10.7	9-12	22.6	17-29	33.3	27-39	1:1.4
36	9	12.1	11-13	27.9	22-33	40.0	35-45	1:1.3
64	4	13	13	31.8	30-34	44.8	43-47	1:1.1
100	1	13	n/a	34	n/a	47	n/a	n/a

Table 2 shows the details of the species richness found in each area category. It is obvious, as expected, that species richness increases with size of area whether we look at slugs, snails or both combined, and this increase happens whether we consider the mean, the maximum or the minimum for each case. There is, however, another trend in these figures. The proportionate range of counts for individual areas within each size class decreases as the class itself increases. This is in part a statistical artefact: there are fewer examples of the larger size classes and they increasingly overlap. At the limit (the whole 10km square), we have only one value. However, there is no overlap among the tetrads and the evidence is that they differ considerably among themselves.

The obvious consequence of these differences is that while there is a positive SAR in all cases (Fig 2), explaining more than 95% of the variation among sizes of area (the R^2 values in the figure), the slopes differ greatly among the relationships shown by using minimum, average or maximum richness. While the meaning of these differences is discussed later, it prompts questions about the variation shown among the tetrads. While we cannot dismiss the possibility that inadequate or variable sampling efficiency makes a contribution (Cameron & Pokryszko, 2005), any environmental correlations with richness will suggest that there is real variation in richness among tetrads.

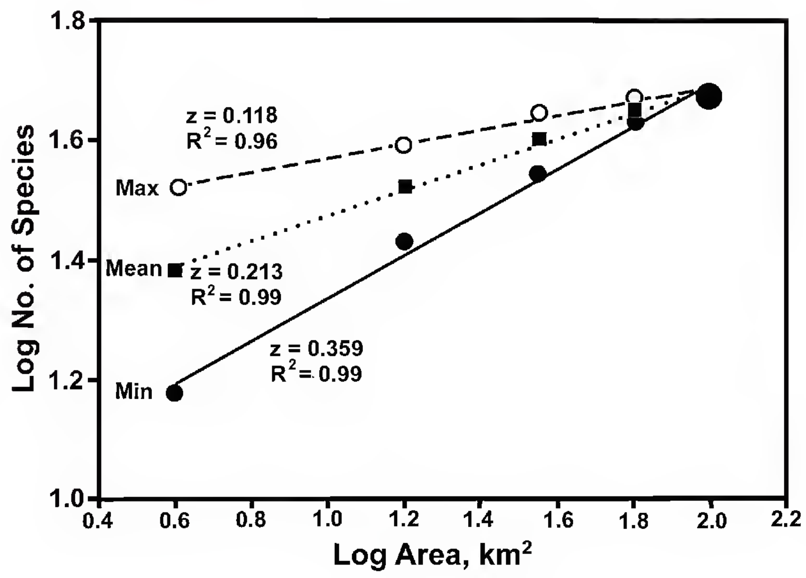

Fig.2. The species/area relationships within square 44:20 using maximum, mean and minimum values of richness for each area category. The slopes and R^2 values are shown. The large black circle represents the value for the whole square.

There is a strong association between species richness and minimum altitude within each tetrad (the lower, the more species, Table 3). There are similar, but weaker, negative

relationships with the maximum altitude and the proportion of the tetrad above 200m. There is also a strong positive association between species richness and deciduous woodland cover. Including coniferous woodland weakens this relationship; coniferous woods are hostile for snails. The two features, altitude and deciduous woodland cover, are themselves strongly associated. While ranking removes some possible statistical artefacts it can obscure the shape of a relationship. Fig. 3 shows that while the relationship with altitude is roughly linear, that with woodland cover is better expressed as a logarithmic relationship; there appears to be something approaching a threshold of woodland cover above which further increases have little effect.

Table 3. The values of Spearman's ρ for the association of ranked values of species richness with deciduous woodland cover and the lowest point in each tetrad (lower points ranked higher), and between the two environmental factors. All are highly significant.

Association	**Spearman's ρ**	**P**
Richness/Woodland	0.849	<0.001
Richness/Lowest point	0.805	<0.001
Woods/ lowest point	0.822	<0.001

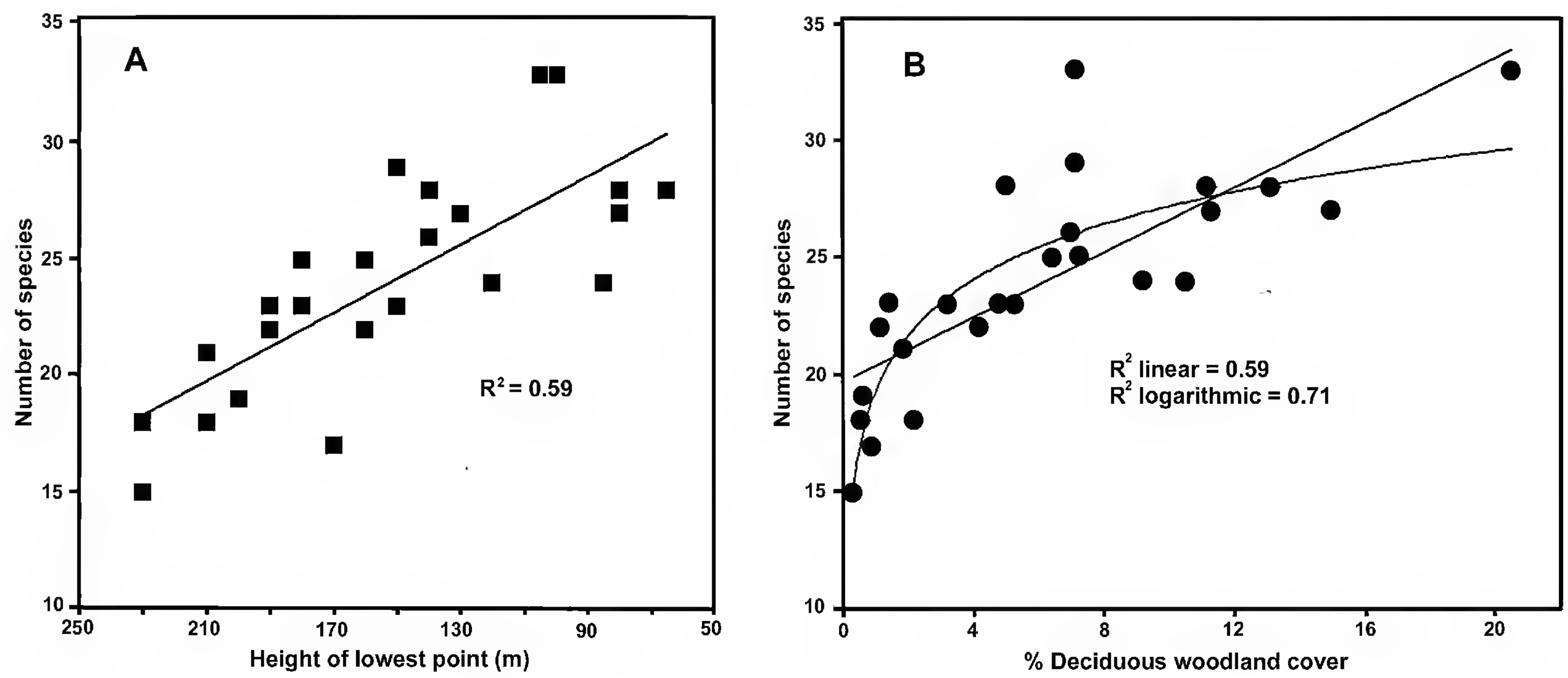

Fig.3. A: the regression of species richness on minimum altitude among tetrads. B: the regression of species richness on the proportion of deciduous woodland cover. In B, the regression lines are shown both for the linear relationship and for species richness on the logarithm of woodland cover. The logarithmic relationship is curved because the scale is arithmetic. The values of R^2 indicate the amount of variation accounted for by the relationship. For deciduous woods, the logarithmic relationship is a better fit.

I have not so far mentioned differences in these associations between slugs and snails. The known slug fauna of Britain has increased considerably since Lloyd conducted his survey (Rowson *et al.*, 2014). Using the list recognised at the time (Waldén, 1976), the 13 slugs recorded in the 10km square represent 50% of those deemed to be native to Britain, whereas the 34 snails represent 37% of the number of known natives. Eleven slugs were found in the richest tetrad, 42% of the then known national fauna, compared with 24 snails, 27% of the

national fauna. Five out of the ten species found in all tetrads were slugs. These differences, though small, suggest that slugs may be more widely distributed at these scales than are snails.

Discussion

When a SAR is constructed according to Rosenzweig's (*loc. cit.*) rules (larger areas must include the smaller), it is obvious that any variation in richness at the smallest scale will mean that the slope obtained will depend on the starting point chosen when the end point is the same in each. As I have pointed out elsewhere (Cameron, *loc. cit.*), there are many areas of less than $1km^2$ in Britain that hold more species than found in the richest of Lloyd's tetrads and a few that hold more than have been found in the whole of his 10km square. It is indeed an "ordinary" square, lacking limestone or significant undisturbed wetlands.

While incomplete sampling may account for some differences in richness among small areas identical in size, it is evident from Lloyd's data that even at this scale (tetrads) richness is affected by the range of habitats: lowland is richer than upland; well-wooded areas are richer than those with less, though there is a threshold effect. As the size of area is increased it is more likely to include the best habitats. At the very smallest scales this is something recognised by Rosenzweig (*loc. cit.*), who pointed out that in this case areas such as $1m^2$ quadrats will necessarily miss the whole range of habitats present in larger areas, and that therefore slopes of SARs will tend to be steeper at these scales. The point at which they flatten out will depend on which organisms are being considered and the scale, or grain, of habitat heterogeneity. Like many areas of Britain, the Penistone square contains a mosaic of habitats such that some may be missing even from a tetrad while present in the larger 10km square.

What this shows is that the neat, linear SARs obtained in many studies apply over only a part of the scale over which studies can be made. In the specific case of snails, I attempted to deal with this by using the maximum values of richness for areas less than $100km^2$ (Cameron, *loc. cit.*). Using Lloyd's original data and extending beyond his square up to the total British fauna, I found a value of z, the slope, of 0.133. Including data added here this decreases slightly to 0.127. The value is close to, but a little steeper than, values based on starting points on the Isle of Wight (0.083) and Suffolk (0.107), reflecting the slight decrease in richness northwards in Britain, but where the end point (the whole of Britain) is the same in each case. What is noteworthy about these values is that they are remarkably similar to that obtained for breeding birds (0.110) by Gaston & Blackburn (2000), starting with a small wood in Berkshire and extending to Britain as a whole. These low values suggest that Britain is relatively homogeneous, biogeographically speaking; most species of both birds and snails have managed to spread over most of the country, occupying those places that are suitable. As Lloyd commented, there were no rarities in his square; it was indeed a typical chunk of countryside.

Snails have proverbially poor powers of active dispersal and suitable microhabitats often change over very short distances. Hence it comes as no surprise that the slopes of SARs are much greater in very small-scale studies. Myšák *et al.* (2013) found z values of 0.325 and 0.373 when moving from areas of $0.062m^2$ to $0.562m^2$ within fens and forests respectively. But within quite small areas of similar habitat, the slope flattens; Cameron (*loc. cit.*) found z values in the range 0.07 to 0.13 over an area range from less than $1m^2$ to a few hundred m^2 within a number of habitats. These are not meaningfully different from those reported for the much larger areas

considered here but have a different cause. The heterogeneity of richness at the tetrad scale in the Penistone square reflects the particular scale of habitat heterogeneity rather than the dispersal powers of snails. The greater proportion of slugs among those species most widely distributed may, however, reflect their accidental dispersal by us in horticultural and other exchanges.

While I have used Lloyd's data in more ways than he did in his original paper, it is the quality of those data and the inspiration that led him to sample in the way that he did that make such analyses possible. It took others a quarter of a century to catch up. Building on such work is my tribute to informed and thorough amateur observation.

Acknowledgements
Adrian Norris gave me background information on Lloyd's survey and provided me with other records made by Lloyd and himself a few years after the survey was published.

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Field note: The Lealholm Proboscidean tooth

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Introduction
In October 2016 a proboscidean tooth was discovered on the hillside above Lealholm village in the Esk Valley of North Yorkshire (VC62). Lealholm is about 10 miles inland from Whitby. This field note records the finding and briefly discusses the condition, identification and possible origin of the tooth and considers other similar finds in this area.

Graham Featherstone of Lealholm, Whitby, provided this information about its discovery:

"A friend of mine mentioned to me that he had found a large fossil whilst clearing out a ditch at his home above Lealholm. He had no idea what it was. A friend of his, who happened to be a vet, called at his house and suggested that the fossil was a mammoth's tooth. Knowing I was a keen naturalist, the finder mentioned the tooth to me and I asked if I could borrow it to take photographs. The tooth was shown to a geologist friend of mine (Chris Pellant) and he confirmed that it was possibly a mammoth's tooth. Having no interest in the tooth, the original finder gave it to me and it is now proudly in my possession."

Location, size and condition
The site of the ditch in which the tooth was discovered is almost exactly on the 180m contour line above and to the north of Lealholm village. Here, the floor of the Esk Valley is some 100m asl. The ditch cuts through about 10cm of peaty soil below which, to a depth of 1m, the sediment in which the tooth was found is a fine-grained clay with numerous angular fragments of local sandstone up to 15cm in size. It may be relevant that during the most recent glaciation, ice came into this area from three main directions. Boulder clay containing erratics of granite from Shap was brought from the west; ice also moved from the north and left behind erratics from Northumberland, including Whin Sill and Cheviot rocks, and ice came from the east across the North Sea area, bringing with it fragments of rhomb porphyry. At Lealholm there is a moraine that blocked the valley and possibly ponded water to the west, ice filling the valley to the east. The high ground of the North York Moors is thought to have been free from ice, though it would have been tundra-like, no doubt with permafrost conditions.

The tooth, which weighs 6.6kg and is 22cm x 32cm, is mainly pale grey, as can be seen from the photographs (see front cover and Plate 2, centre pages). In this it differs from many of the more brown-coloured Pleistocene proboscidean teeth which are not uncommon in outwash gravels and glacial sands farther south in Yorkshire (the Holderness coast, for example), Lincolnshire, Norfolk and the east Midlands. The whitish colouring may be due to mineralization, possibly by calcite ($CaCO_3$). This process could also have increased its weight slightly. Stuart Ogilvy, of the Yorkshire Museum, suggested that the mineralization may take up to a million years (pers.comm.). The grinding surface of the tooth is rather worn, possibly indicating that the animal was reasonably mature. The tooth has slight grooves and a 'crazed'

pattern on its surfaces. This could be due to exposure to the influence of frost and wind on a tundra or permafrost surface over a considerable time.

Identification

It was not difficult to identify the tooth as that of a mammoth or related animal, but a more specific identification was initially not possible. However, the fortuitious arrival of the Yorkshire Geological Circular no 603 which summarised the paper *Doggerland Mammalian Remains in a Broader Context* by Prof. Thijs van Kolfschoten of Leiden University, The Netherlands, enabled me to take the next step in specific identification. I contacted Prof. van Kolfschoten and he commented on the 'interesting find' and forwarded my images to his colleague Dr Hans van Essen, an expert on mammoth remains. Dr van Essen, though always careful to point out that identification from photographs can be 'a bit tricky', commented that the tooth was possibly from the left upper jaw of a mammoth, probably not a straight-tusked elephant *Palaeoloxodon* sp. which, though not uncommon in some parts of England such as the Cromer Forest Bed Formation in Norfolk, tends to occur in interglacial deposits. There are two mammoths with advanced dental morphology - the Steppe Mammoth *Mammuthus trogontherii* (Pohlig, 1885) and the Woolly Mammoth *M. primigenius* (Blumenbach, 1799). These are found more recently than 0.7 million years ago. Initially, Dr van Essen gave it as his opinion that the tooth from Lealholm is probably from the Steppe Mammoth. However, on examining images I emailed to him of the front roots of the tooth, he later suggested that it could be a 'rather rare early Woolly Mammoth or a late Steppe Mammoth.' The tooth has the appearance of middle Pleistocene mammoth molars from the Netherlands (Wolstonian interglacial 352,000 to 130,000 years ago) and the tooth is much heavier and more massive than those from the most recent Devensian glacial episode popularly known as the Ice Age (110,000 to 12,000 years ago). Dr van Essen suggested that the Lealholm proboscidean tooth may be from an animal that lived c.200,000 years ago, before the most recent glacial advance into this area of North Yorkshire, and that its remains, including the tooth, were caught up in later moraine movement and deposition. Certainly this is the case with mammoth teeth from boulder clay in Norfolk containing Scandinavian erratics. Such fossils could have been frozen into the ground over which an ice sheet moved and may then have been picked up by moving ice and carried along. However, to prove definitely from which animal the tooth came, its age should be determined. Dr Van Essen contacted Prof. Adrian Lister at the Natural History Museum, as he is interested in any British mammoth finds. Prof. Lister says that the age of the tooth should be ascertained either by sediment analysis or radio-carbon dating, to prove whether it's from a mammoth or possibly an Asian Elephant *Elephas maximus*.

Other local finds

Proboscidean remains are not common in the area and, though a number of museums have been contacted to try to establish field locations for North Yorkshire mammoth fossils, identification of these specimens may not be up to date, especially as many records are historical. Molars labelled 'elephant' are recorded from Kirkdale Cave in 1823 (Buckland, 1823). These have since been deemed to be from a straight-tusked elephant which is typical of an 'Ipswichian' warm interglacial fauna (Boylan, 1981).

Many local records tend to be catalogued as Woolly Mammoth and, though North Yorkshire museums hold numbers of such fossils (see Rutter, 1956), it would seem that few have field

locations. The Dorman Museum in Middlesbrough holds a mammoth tooth collected in 1934 at the now defunct Barmpton quarry near Darlington. Also from Barmpton is a fragment of tusk found in 1978. This is now in the Tyne and Wear Museum. Further tusk remains have been found at Hartlepool Docks (Jessop, 2013) and Robin Hood's Bay (Young, 1822; Bevan, 1909).

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YNU Notice: Annual General Meeting

The next Annual General Meeting of the Yorkshire Naturalists' Union will be held in the Wolfson Room at the Bramall Learning Centre in the Royal Horticultural Society Garden Harlow Carr, Harrogate, on Saturday 18th November 2017.

The day will start with registration and refreshments at 10.30am followed by a meeting of the Natural Sciences Forum. Picnic bag lunches will be provided by Betty's Café Tea Rooms, and will include vegetarian options. The AGM will take place after lunch, beginning with a Welcome Address by Harrogate and District Naturalists' Society, which celebrates its 70th anniversary this year. This will be followed by the presidential address from outgoing YNU President, Mrs Sarah White, entitled *"From Cow Green to Rewilding: A 50 year Journey"*.

The price is £12 per person. For further information, including the agenda and online and postal booking forms, please visit our website or contact Paula Lightfoot on p.lightfoot@btinternet.com.

Freshwater plants and SSSI canals in the East Midlands and North of England 2: Chesterfield Canal, Cromford Canal and Grantham Canal

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The aims of the study were to record aquatic plants and their abundance in canal SSSIs in the East Midlands and North of England, to assess present-day botanical conservation interest and to identify changes since the sites were notified as SSSIs in the 1980s or earlier. The first article in the series (Goulder, 2016) considered the Leeds and Liverpool Canal and the Huddersfield Narrow Canal. This second article addresses SSSIs along the Chesterfield Canal, Cromford Canal and Grantham Canal (see Plate 3, centre pages). Subsequent articles will consider the Leven Canal and Pocklington Canal and will provide an overview.

The canal SSSIs

Chesterfield Canal

The Chesterfield Canal SSSI runs for 19.4km from Whitsunday Pie Lock (SK722821), 2km north-east of Retford, in an approximately north-eastwards direction to Cooper's Bridge (SK761943) at Misterton. It is in Vice-County 56 Nottinghamshire. The canal is broad gauge, it traverses largely arable countryside, its course is circuitous and there are only two locks (not including Whitsunday Pie Lock) along the SSSI. Commercial navigation, always horse-drawn, had faded away by the mid-1950s (Richardson, 2009) but the canal remained open to leisure boats. Boat usage is relatively low; Gringley Lock, which is within the SSSI, was operated 488 times during 2015 (CRT, 2016), although this had increased from 253 in the previous year. Eleven boat movements were observed along the SSSI during 3 days of recording in May-June 2015. Much of the channel has soft margins with emergent vegetation and has relatively little tree cover.

Cromford Canal

The Cromford Canal SSSI (in VC57 Derbyshire) extends for 8.1km from Cromford Wharf (SK300570) roughly south-eastwards to Ambergate. The canal environs are rural and post-industrial and are in places steeply-sloped woodland. This section of canal is narrow gauge, is on one level and was isolated by the collapse of Butterley Tunnel (5.1km beyond Ambergate) in 1900; coal traffic continued for a while on the isolated section but the canal was abandoned and derelict by the mid-1940s (Potter, 2011). Ownership was transferred to Derbyshire County Council in 1974 and dredging and restoration work was undertaken by the Cromford Canal Society in the 1970s and 1980s; from the late 1970s a horse-drawn trip boat was regularly operated along about 2.1km of canal south from Cromford Wharf. Navigation had been extended by 1988 for a further 1.4km but, following flood damage in 1989 and the disbandment of the Society in 1990, the restored canal again drifted towards dereliction (Stoker, 2008). Meanwhile the southern part of the SSSI, 3.6km of canal from Whatstandwell to Ambergate, became a Local Nature Reserve which is administered by the Derbyshire Wildlife Trust (Turley *et. al.*, 2002). The management plan for the canal corridor (Derbyshire County

Council, 2007) envisages conservation strategies that should benefit both the historic built environment and the natural environment; these include mending leaks, improving water flow, pruning and strategic felling of trees and restoration of a channel to enable maintenance by boat. In early 2013 a suction dredger was used to clear the channel along 2.0km from Cromford Wharf; this section of canal is now regularly navigated by a trip boat. Further south the channel is in places very shallow (<10cm deep) and extensively overgrown by emergent vegetation, although there is evidence of tree clearance and stemming of leaks.

Grantham Canal

The Grantham Canal SSSI (in VC55 Leicestershire) extends on one level for 6.5km from Rectory Swing Footbridge at Harby (SK747317) roughly eastwards to Redmile Mill Bridge (SK790359). Traffic on the broad-gauge Grantham Canal had ceased by the 1920s; the navigation was closed by Act of Parliament in 1936 and became derelict (Anon, 2014). The environs are deeply rural, being largely arable with some pasture. In summer 2015 tall emergent marginal vegetation was ubiquitous along the canal and in places more or less occupied the whole channel, while submerged and floating-leaved plants were abundant. Part of the SSSI was dredged on behalf of the Canal & River Trust during October-December 2014; i.e. from Jericho Bridge (SK776353) eastwards for 1.6km to the limit of the SSSI at Redmile Mill Bridge and onward for a further 0.9km to Redmile Town Bridge; the intention was to make an open channel along the middle of the canal with the aim of encouraging submerged aquatic plants, especially Grass-wrack Pondweed *Potamogeton compressus*. To this end there was also an associated scheme to reintroduce Grass-wrack Pondweed to this part of the canal. (CRT, 2014; Anon, 2015). In summer 2015, notwithstanding the dredging, this section had extensive aquatic vegetation of both emergent and submerged/floating-leaved plants.

Recent plant records and change since SSSI notification

I divided each SSSI into discrete lengths for survey in 2015 (Table 1). In the Chesterfield and Grantham Canals these were 0.5km lengths; in the Cromford Canal they were delineated by topographical features, usually bridges, and ranged from 0.2-1.3km (mean 0.7km). Only plants on the JNCC (2005) *Common Standards Monitoring Guidance for Canals* checklists for native aquatic plants and non-native aquatic vascular plants were routinely recorded. Recording was by eye but in addition submerged plants in the Chesterfield and Grantham Canals were retrieved by at least 20 grapnel hauls per 0.5km length; plants from the Cromford Canal were retrieved for identification using a walking pole, extensible to 1.5m, with a hook on its end. Recording was mostly from the towing path and emergent plants on the far side were identified using binoculars. When two species were present with relatively similar morphology that made them difficult to separate using binoculars, they were recorded as a single category; e.g. Lesser Water-parsnip/Fool's-water-cress in the Grantham Canal and Greater Pond-sedge/Lesser Pond-sedge in the Chesterfield Canal.

The abundance of each plant in each length was described using a truncated 3-point DAFOR scale; i.e. dominant or abundant (d/a), frequent (f) and occasional or rare (o/r). For the Chesterfield and Grantham Canals the DAFOR scores were converted from estimates of whole-channel cover; i.e. d/a=>5% cover, f=0.1-5% cover, and o/r=<0.1% cover. To obtain an approximate integrated measure that represented both species richness and abundance in each canal length, the DAFOR scores were converted to numerical abundance scores (i.e.

d/a=3, f=2, o/r=1) and the sum of these abundance scores (*∑AS*) was calculated. Recording was during May-September 2015, except that a few records are included for the Cromford Canal from visits in 2013 (Goulder, 2014), and was along 4.5km of the Chesterfield Canal (about 23% of the SSSI), 8.1km of the Cromford Canal (the whole of the SSSI) and 6km of the Grantham Canal (about 86% of the 6.5km SSSI plus 0.4km beyond the SSSI boundary).

Table 1. The lengths of SSSI canals surveyed in summer 2015

Canal	**Lengths surveyed**
Chesterfield Canal	1. 0-0.5km east (downstream) of Whitsunday Pie Lock (SK722821). 2. 0.5-1km east of Whitsunday Pie Lock. 3. 1-1.5km east of Whitsunday Pie Lock. 4. 0-0.5km east of the A631 viaduct at Drakeholes (SK706906). 5. 0.5-1km east of the A631 viaduct at Drakeholes. 6. 1-1.5km east of the A631 viaduct at Drakeholes. 7. 0-0.5km east of Smith's Bridge (SK754929). 8. 0.5-1km east of Smith's Bridge. 9. 1-1.5km east of Smith's Bridge. In this context 'east' means towards the River Trent rather than geographically east. Names of locations are from Anon (2006).
Cromford Canal	1. Ambergate overflow weir (SK350519) northward to Poysers Bridge (c. 0.2km). 2. Poysers Bridge to Grattons Bridge (c. 0.3km). 3. Grattons Bridge to Chase Bridge (c. 1.3km). 4. Chase Bridge to Crich Council Footbridge (c. 1.3km). 5. Crich Council Footbridge to Whatstandwell Bridge (c. 0.2km). 6. Whatstandwell Bridge to Sims Bridge (c. 0.4km). 7. Sims Bridge to Lea Shaw Bridge (c. 0.8km). 8. Lea Shaw Bridge to south portal of Gregory Tunnel (c. 0.4km). 9. North portal of Gregory Tunnel to south end of Wigwell Aqueduct (c. 1.2km). 10. South end of Wigwell Aqueduct to Browns Bridge (c. 0.5km). 11 Browns Bridge to Lawn Bridge (c. 1.3km). 12 Lawn Bridge to Cromford Wharf (c. 0.5km). Names of locations are from Harrison, Roberts & Potter (2010).
Grantham Canal	1. 4-3.5km west of Jericho Bridge. 2. 3.5-3km west of Jericho Bridge. 3. 3-2.5km west of Jericho Bridge. 4. 2.5-2km west of Jericho Bridge. 5. 2-1.5km west of Jericho Bridge. 6. 1.5-1km west of Jericho Bridge. 7. 1-0.5km west of Jericho Bridge. 8. 0.5km west of Jericho Bridge to Jericho Bridge, Barkestone-le-Vale (SK776353) 9. Jericho Bridge to 0.5km east of Jericho Bridge. 10. 0.5-1km east of Jericho Bridge. 11. 1-1.5km east of Jericho Bridge. 12. 1.5-2km east of Jericho Bridge. In this context directions are in the direction of Nottingham ('west') or Grantham. Names of locations are from Anon (2014).

Nomenclature follows Stace (2010); scientific names are given in the text only if they do not occur in the tables. The complete plant records are available as additional electronic material from http://www.ynu.org.uk/naturalist - (Chesterfield Canal, Appendix 1.1; Cromford Canal, Appendix 1.2; Grantham Canal, Appendix 1.3).

Chesterfield Canal

There was a navigable open-water central channel in summer 2015 within which submerged and floating-leaved plants were not especially conspicuous, although 11 were recorded (Table 2). There was, however, widespread and abundant blanket weed, a filamentous green alga probably *Cladophora*. This was readily visible through the transparent to moderately turbid water and was retrieved *en masse* in most grapnel hauls. In addition, Fennel Pondweed was dominant or abundant in seven of the nine 0.5km lengths surveyed and frequent in the other two while the floating leaves of Yellow Water-lily were dominant/abundant or frequent in Lengths 4-6. Other pondweeds (*Potamogeton*) were Lesser Pondweed, frequent in Length 6 and found in four other lengths, and Curled Pondweed found in two lengths.

Emergent plants were more conspicuous; the canal generally had soft margins and there was often a 1-3m wide stand of marginal vegetation. Seventeen emergent plants were recorded (Table 2). Reed Sweet-grass was the most abundant, being dominant or abundant in seven lengths and frequent in the other two. Dominant/abundant in some lengths and frequent in others were Greater and/or Lesser Pond Sedge, Common Reed and Branched Bur-reed while Yellow Iris was frequent in eight of the nine lengths and Water Dock was found in eight lengths but was frequent in only one of them.

The mean number of species of submerged and floating-leaved plants per 0.5km length was 4.3 (range 3-9), that for emergent plants was 10.9 (9-14) (Table 3). The mean sum of abundance scores (*∑AS*) per 0.5km for submerged and floating-leaved plants was 6.7 (4-12) and for emergent plants 17.1 (13-24). None of the plants recorded was rare or scarce in VC56 (Wood & Woods, 2013). Also found were non-JNCC-checklist wetland plants which included Hart's-tongue *Asplenium scolopendrium*, Cuckooflower *Cardamine pratensis*, Hairy Sedge *Carex hirta*, Great Willowherb *Epilobium hirsutum*, Field Horsetail *Equisetum arvense*, Meadowsweet *Filipendula ulmaria*, Hard Rush *Juncus inflexus*, Gypsywort *Lycopus europaeus*, Water Figwort *Scrophularia auriculata* and Marsh Woundwort *Stachys palustris*.

The 1987 SSSI notification (Natural England, 2016) described a nationally uncommon community of submerged plants characteristic of brackish nutrient-rich water, which included the usually maritime Brackish Water-crowfoot. There were five pondweeds: Fennel, Perfoliate, Small, Lesser and the nationally scarce Linton's. Also important were Canadian and Nuttall's Waterweeds, Spiked Water-milfoil, Short-leaved Water-starwort and Amphibious Bistort. Rich marginal vegetation was also referred to: Greater Pond-sedge, Reed Sweet-grass, Common Reed and Branched Bur-reed were locally dominant while Greater Tussock-sedge, Yellow Iris and Water Dock were also mentioned. Surveys of aquatic plants in the Chesterfield Canal, including the SSSI, were carried out on behalf of the Nature Conservancy Council, Natural England and English Nature in or around 1986 (Alder, 1986), 1987 (Smith, 1987), 1993 (Anon, 1993), 2002 (Smith, 2002) and 2009 (Broughton, 2010).

There appear to have been significant changes in the aquatic flora over the nearly 30 years since notification of the SSSI which have been most pronounced amongst submerged and floating-leaved plants. A species-rich community that included widespread Short-leaved Water-starwort, Nuttall's Waterweed, Fat and Common Duckweeds, Spiked Water-milfoil, Small, Linton's, Fennel, Perfoliate and Lesser Pondweeds and Brackish Water-crowfoot (Alder, *loc. cit.*; Smith, 1987; Anon, 1993) has been replaced by a community with fewer species. In 2015 this largely comprised dominant or abundant Fennel Pondweed and widespread but less abundant Lesser Pondweed and Common and Ivy-leaved Duckweeds, all accompanied by great masses of *Cladophora*-like filamentous algae. It is clear that this reduction in diversity of the submerged flora has been underway for some time. The formerly widespread Linton's and Perfoliate Pondweeds and Brackish Water-crowfoot were apparently lost by 2009 (Broughton, 2010).

The emergent marginal vegetation, in contrast, appeared to be much the same in 2015 as it was in the late 1980s. Then (Alder, *loc. cit.*; Smith, 1987) as now (Table 2) Reed Sweet-grass dominated the emergent community while Greater/Lesser Pond-sedge, Reed Canary-grass, Branched Bur-reed and Yellow Iris continued to be abundant and/or widespread.

A number of plants previously recorded in the SSSI were not found in 2015 (Table 4). Clearly it is likely that some plants recorded in earlier surveys were still there in 2015 but were missed because only about 23% (nine 0.5km lengths) of the SSSI was surveyed. In support of this is that a number of mainly submerged/floating-leaved plants that were not recorded in the 2015 survey were found relatively recently in the 2009 survey of the whole SSSI (Broughton, 2010); these included Short-leaved Water-starwort, Rigid Hornwort, Nuttall's Waterweed, Spiked Water-milfoil, Small Pondweed, Common and Fan-leaved Water-crowfoots and White Water-lily, although some of these were very sparingly distributed.

Some of the apparently lost plants are nationally scarce (Short-leaved Water-starwort and Brackish Water-crowfoot) or in VC56 are rare (Creeping Forget-me-not) or possibly extinct (Greater Spearwort) (Wood & Woods, *loc. cit.*). Also apparently lost is Linton's Pondweed; Broughton (2010) emphasizes that this is a serious loss because the Chesterfield Canal is the worldwide type location for this plant (Dandy & Taylor, 1939). The loss of Brackish Water-crowfoot removes the floristic evidence for the canal being a brackish-water site. Some of the apparent losses are, however, not regrettable, notably the alien Canadian and Nuttall's Waterweeds and Water Fern.

Cromford Canal

Submerged and floating-leaved vegetation was conspicuous along much of the Cromford Canal in summer 2015 and altogether 17 plants were recorded in 2013/2015 (Table 2). From Ambergate northwards to the south end of Wigwell Aqueduct (Lengths 1-9) there was intermittent tree-shading. In unshaded and lightly shaded places a shallow and frequently narrow central channel between extensive margins of emergent vegetation was often occupied by extensive growth of water-starwort. Woods (2014) has identified this plant as Various-leaved Water-starwort *Callitriche platycarpa*. Common Duckweed (possibly with Least Duckweed) was also dominant or abundant in six of Lengths 1-9 while Ivy-leaved Duckweed was dominant/abundant in Length 3 and frequent in two other lengths. Rigid Hornwort was

dominant/abundant from c.200m south of Gregory Tunnel to the southern portal of the tunnel (Length 8). The invasive alien New Zealand Pigmyweed was present between Poysers Bridge and Chase Bridge (Lengths 2 & 3). Small Pondweed was also occasionally found in Lengths 2 & 3. Immediately south of Wigwell Aqueduct (Length 9) there was flowing water downstream of stop planks and here was a submerged stand of water-crowfoot; this was not flowering in September 2015 but flowers were found during an earlier visit in June 2013 (Goulder, 2014) and the plant was identified as Stream Water-crowfoot. Curled Pondweed was not recorded in September 2015 but it was locally frequent in Length 9 in June 2013.

The c.0.5km of canal from the south end of Wigwell Aqueduct northward to Browns Bridge (Length 10), which was largely unshaded, had the most interesting association of submerged and floating-leaved plants. In the trough of Wigwell Aqueduct, in which was deep water, there was a more-or-less complete cover of Broad-leaved Pondweed with scattered Canadian and Nuttall's Waterweeds, Common Duckweed, Spiked Water-milfoil, Fan-leaved Water-crowfoot and Unbranched Bur-reed. North of the aqueduct was open water, kept so by the operation of the trip boat that turns there, that had extensive submerged beds of Canadian and Nuttall's Waterweeds, Spiked Water-milfoil and Fan-leaved Water-crowfoot. Fennel Pondweed was not recorded in September 2015 but it and Curled Pondweed were occasional/rare here in June 2013. For about the first 200m north of Brown's Bridge, in Length 11, there was relatively little shade and submerged Spiked Water-milfoil and Fan-leaved Water-crowfoot persisted; further north, however, there was deep tree shade for about 1km and the recently dredged channel had virtually no aquatic vegetation. The final c.100m of Length 11 to Lawn Bridge and Length 12 towards Cromford Wharf were less shaded but the dredged open-water channel used by the trip boat, between wide margins of Reed Sweet-grass, had not been colonized by submerged or floating-leaved plants. Greater Water-moss, attached to masonry margins and other surfaces, was abundant at Cromford Wharf.

Emergent marginal vegetation was conspicuous in the Cromford Canal in places where it was not densely shaded by trees. Twenty-two emergent plants were recorded (Table 2). Reed Sweet-grass was the most important and was dominant or abundant, generally or at least locally, in all lengths except for Length 10, which largely had hard vertical edges. Branched Bur-reed was also dominant or abundant at the south end of the canal, being so in Lengths 1-3; also widely distributed and frequent in some lengths were Fool's-water-cress, Yellow Iris, Soft-rush, Water Mint, Water Forget-me-not, Reed Canary-grass and Bulrush.

There were other stands of emergent plants that are worthy of note. (1) The long-naturalized alien Sweet-flag and also Water Horsetail that were found in species-rich marginal vegetation in the winding-hole (a wide place intended for boats to turn) between Poysers Bridge and Grattons Bridge (Length 2) where they occurred with Fool's-water-cress, Lesser Water-parsnip, Water Mint, Water Forget-me-not, Branched Bur-reed, Bulrush and the non-JNCC-checklist plants Great Willowherb, Meadowsweet and Water Figwort. (2) Lesser Spearwort found on a mid-channel bank of silt immediately upstream of Lea Shaw Bridge (Length 8) together with Water-plantain, Reed Sweet-grass, Yellow Iris, Water Mint, Water Forget-me-not and Brooklime. (3) Great Yellow-cress which was widespread (recorded in six lengths) but was never more than occasional/rare and was not flowering in September 2015; this plant was in flower and more conspicuous in June 2013.

The mean number of species per canal length for submerged and floating-leaved plants was 3.8 (range 1-8), that for emergent plants was 8.3 (4-14). The mean sum of abundance scores (*∑AS*) per canal length was 8.1 (3-18) for submerged and floating-leaved plants and 12.1 (4-22) for emergent plants (Table 3.2). Especially notable is that Length 10, with its largely-unshaded open water but sheer sides, had the highest species richness and *∑AS* for submerged/floating-leaved plants (8 and 18 respectively) but only four species and a low *∑AS* (4) for emergent plants. Also notable was the lack of diversity in the extreme northern end of the Canal. Length 12 had only Greater Water-moss and Reed Sweet-grass as dominant/abundant plants; altogether only 5 species were found there and their *∑AS* at 10 was the lowest of all the lengths surveyed.

None of the plants recorded is rare or scarce in VC57 (Willmot & Moyes, 2015), although Fan-leaved Water-crowfoot and Various-leaved Water-starwort (identified by Woods, *loc. cit.*) are locally declining species. Non-JNCC-checklist wetland and riparian plants in addition to those mentioned above included Wild Angelica *Angelica sylvestris*, Hart's-tongue, False Fox-sedge *Carex otrubae*, Pendulous Sedge *Carex pendula*, Remote Sedge *Carex remota*, Field Horsetail, Hemp-agrimony *Eupatorium cannabinum*, Common Marsh-bedstraw *Galium palustre*, Indian Balsam *Impatiens glandulifera*, Jointed Rush *Juncus articulatus*, Hard Rush, Gypsywort, Skullcap *Scutellaria galericulata* and Marsh Woundwort.

The 1981 SSSI notification (Natural England, *loc. cit.*) described a eutrophic freshwater habitat with a rich flora of submerged and emergent plants. Abundant submerged/floating-leaved plants were Rigid Hornwort, Canadian Waterweed and Broad-leaved Pondweed; also present were water starworts, Curled Pondweed and Unbranched Bur-reed. Rarer species were said to include Soft Hornwort, Small, Various-leaved and Grass-wrack Pondweeds and Round-leaved Crowfoot. Reed-swamp communities sometimes occupied the whole width of the Canal and were dominated by Reed Sweet-grass or Branched Bur-reed; other emergent plants mentioned were Sweet-flag, Water-plantain, Narrow-leaved Water-plantain, Lesser Water-parsnip, Flowering-rush, Water Horsetail, Water Mint, Water Forget-me-not, Water-cress, Lesser Spearwort and Great Yellow-cress. Surveys of aquatic plants in the Cromford Canal SSSI were carried out by Derbyshire Naturalists' Trust in 1975 (Deadman & Pondlebury, 1976) and by the Matlock Field Club in 1979-1981 (Anon, 1981). There were surveys by environmental consultants for English Nature in 2000 (Anon, 2001) and for Derbyshire County Council in 2014 (Woods, *loc. cit.*).

Anon (1981) described principal features of the canal vegetation between the south end of the SSSI and Gregory Tunnel (c.4.9km) as it was in 1979, which pre-dated the 1981 notification. In 1979, as in 2015, this section was intermittently shaded with deep tree shade in places suppressing vegetation. At that time parts of the channel were dry while elsewhere, as in 2015, the water tended to be shallow and the channel much overgrown. There had been some recent clearance of what was described as choking vegetation. Extensive cover of submerged/floating leaved plants was described at some sites: e.g. water starwort between Ambergate overflow weir and Poysers Bridge (Length 1), which was still there in 2015; Broad-leaved Pondweed between Poysers Bridge and Grattons Bridge (Length 2) – not found at this location in 2015. Submerged/floating-leaved plants that were specifically mentioned as features of the 1979 vegetation south of Gregory Tunnel were water starworts, Rigid Hornwort,

Canadian Waterweed, Ivy-leaved Duckweed, stonewort (*Nitella*), Curled and Broad-leaved Pondweeds and Unbranched Bur-reed; also recorded were Common Duckweed and Round-leaved Crowfoot. A number of these plants were still to be found in this southern section of the SSSI (Lengths 1-8) in 2015: i.e. water starwort, Rigid Hornwort and Common and Ivy-leaved Duckweeds (Table 2). Water starwort and Rigid Hornwort which were importand features in 1979 continued to be in places dominant/abundant in 2015.

The 1979 survey and later work in 1981 (Anon, 1981) did not address in detail the vegetation from north of Gregory Tunnel to Cromford Wharf (c.3.5km). This is the section of canal that was incrementally restored for navigation over a number of years in the 1970s and 1980s; a process that involved the thorough clearing and dredging of the waterway (Stoker, *loc. cit.*). The restored navigation was abandoned by 1990; restoration and subsequent abandonment appear to have left a legacy that favours submerged and floating-leaved plants; many of those that were mentioned in the 1981 SSSI notification were found there (Lengths 9-12) in 2013 and/or 2015 i.e. water starwort, Rigid Hornwort, Canadian Waterweed and Curled and Broad-leaved Pondweeds. Not recorded there in 2015 but mentioned in the 1981 notification were Soft Hornwort, Small, Grass-wrack and Various-leaved Pondweeds and Round-leaved Crowfoot, although Small Pondweed was found further south in Lengths 2 and 3.

The 1979 survey (Anon, 1981) also described emergent vegetation over the c.4.9km south of Gregory Tunnel. This was abundant except where restricted by tree shading and was dominated by Reed Sweet-grass, which thrived where the channel had become dry and tended to out-compete other plants in shallow water. Other emergent plants that were mentioned as conspicuous were Fool's Water-cress, Lesser Water-parsnip, Lesser Pond-sedge, Water Horsetail, Water Mint, Water Forget-me-not, Amphibious Bistort, Branched Bur-reed and Great Yellow-cress. Also there, but less abundant, were Sweet-flag, Water-plantain, Flowering-rush, Marsh-marigold, Floating Sweet-grass, Yellow Iris, Water-cress, Lesser Spearwort, Arrowhead and Bulrush. Much of this diverse emergent flora has persisted; all of these plants except Flowering-rush, Floating Sweet-grass, Amphibious Bistort and Arrowhead were also recorded in 2013 and/or 2015 (Table 2)

In the context of persistence, the emergent community in the winding-hole between Poysers Bridge and Grattons Bridge (Length 2) is particularly interesting. In summer 1979 the winding-hole was in the process of being cleared of dominant Branched Bur-reed (Anon, 1981); this plant was still dominant/abundant in 2015. Also there in both 1979 and 2015 were Sweet-flag and Water Horsetail, both plants with a limited distribution in the canal.

Plants that were recorded in the SSSI up to 2000 but were not recorded in 2013/2015 are listed in Table 4. The apparent loss of six submerged/floating-leaved plants, including three pondweeds, is notable. Of these, according to *The Flora of Derbyshire* (Willmot & Moyes, *loc. cit.*), Soft Hornwort is very rare in VC57 but has apparently been recorded recently in the Cromford Canal, although not after 2003. Grass-wrack Pondweed is very rare, Lesser Pondweed is sparsely distributed and no records are cited for Various-leaved Pondweed. Round-leaved Crowfoot is, in contrast, frequent although largely in the north of the county. Amongst the eight apparently lost emergent plants, Narrow-leaved Water-plantain occurs very rarely in Derbyshire, Bogbean is rare apart from on some bogs in the north of the county;

Flowering-rush, Common Spike-rush, Floating Sweet-grass, Amphibious Bistort and Arrowhead are occasional.

Grantham Canal

In summer 2015 the Grantham Canal SSSI was largely unshaded and had luxuriant aquatic vegetation throughout. Essentially there was almost always a central channel of highly transparent water perhaps 0.5-1m deep, often with a more or less complete cover of submerged and floating-leaved plants; 12 species were recorded (Table 2). Blanket weed was also generally abundant. The most conspicuous plant of the submerged and floating-leaved community was Water-soldier. Although this plant is probably native in East Anglia other populations in England, as in the Grantham Canal, are likely to be derived from introductions or escapes from water gardening (Preston & Croft, 1997). It was recorded as dominant/abundant over 5km of canal (Lengths 3-12) (Table 2) where its free-floating rosettes often occupied most, or virtually all, of the central channel. There was also substantial biomass of Rigid Hornwort in several 0.5km lengths, especially towards the western end of the SSSI. It was dominant/abundant in Lengths 1, 3, 4 and 5 and additionally further east in Length 12 where it was east of Redmile Mill Bridge and thus beyond the boundary of the SSSI. Duckweeds were also conspicuous: Common Duckweed (perhaps with Least Duckweed) was dominant or abundant in eight of the twelve 0.5km lengths and Ivy-leaved in 10 lengths (Table 2). The nationally rather uncommon Frogbit was also present, its free-floating rosettes were found in seven lengths. It was most notable further west, being dominant/abundant in Length 2. Few pondweeds were encountered; only Curled and Fennel Pondweeds were found and each was recorded as occasional/rare and in only one 0.5km length. The mean number of species of submerged and floating-leaved plants per 0.5km length was 5.4 (range 3-8) (Table 3). The comparatively high values of $\sum AS$ for submerged and floating-leaved plants, mean 11.7 (range 9-14) (Table 3), emphasized the great abundance of these plants.

Extensive emergent marginal vegetation was characteristic and in places it encroached to occupy virtually the whole width of the canal. Twenty-two emergent plants were recorded (Table 2) and the most conspicuous were Common Reed, which was dominant/abundant in eight of the 12 lengths, and Bulrush, dominant/abundant in nine lengths. In some lengths both plants were recorded as dominant/abundant but they tended to form discrete stands rather than being intermingled. Branched Bur-reed was also important, being dominant or abundant in four lengths and frequent in seven others. Lesser Water-parsnip/Fool's-water-cress, largely the former, were recorded as dominant or abundant in 10 lengths and frequent in the other two; the emergent trailing late-season leafy stems of these plants were frequently found as a basal layer amongst the taller emergent marginal vegetation as well as extending laterally into open water beyond the marginal fringe. Other emergent plants that were dominant/abundant in only one length but less abundant in others were Water Horsetail, Reed Sweet-grass, Yellow Iris and Amphibious Bistort. Flowering-rush was found in eight lengths and was frequent in three of them, but was never dominant/abundant. There were other emergent plants of conservation interest but they were never more than occasional or rare; e.g. Cyperus Sedge, Water-plantain, Greater Spearwort, Arrowhead and Lesser Bulrush. The mean number of emergent species per 0.5km was 12.0 (range 6-15); mean $\sum AS$ for emergent plants was 21.0 (9-26) (Table 3).

Although the Canal east of Jericho Bridge (Lengths 9-12) had been dredged during October-December 2014 it had become abundantly colonized by aquatic vegetation by summer 2015. Substantial marginal emergent vegetation survived although the central open-water channel was somewhat wider than generally observed west of Jericho Bridge. Essentially the post-dredging central channel was occupied by extensive cover of Water-soldier and duckweeds. In addition a huge submerged biomass of Rigid Hornwort had grown to occupy the c.400m of Length 12 that lies east of Redmile Mill Bridge.

West of Jericho Bridge emergent vegetation tended to overwhelm the open mid-canal channel but there were short lengths of c.30-50m of canal that had been cleared of dense emergent vegetation, perhaps to facilitate angling, visual amenity or wildlife conservation, and here there was greater diversity of aquatic plants. In Length 4, for example, a gap of c.30m had been cleared in what was otherwise a more or less solid stand of Common Reed, the open water created having been colonized by Water-soldier and duckweeds. Also growing in the opened-up channel were Flowering-rush, Canadian Waterweed, Arrowhead and Branched Bur-reed.

Jeeves (2011) regards several of the aquatic plants recorded in 2015 as uncommon in VC55. Frogbit and Water-soldier are not frequent in the county and both are probably derived from escapes or introductions. Cyperus Sedge is occasional but possibly approaching scarce, Flowering-rush, Water-cress, Greater Spearwort, Lesser Bulrush and Horned Pondweed are occasional; Rigid Hornwort appears to be rarely recorded in the county. Non-JNCC-checklist plants found in 2015 included Wild Angelica, Hart's-tongue, False Fox-sedge, Great Willowherb, Field Horsetail, Meadowsweet, Hard Rush, Gypsywort, Common Fleabane *Pulicaria dysenterica*, Water Figwort and Skullcap.

The 1981 SSSI citation (Natural England, *loc. cit.*) emphasized the conservation value of both open water and emergent vegetation as representative of slow-flowing-river plant communities of Central and Eastern England and some information was given about which plants were there. In addition an unpublished plant list from Ian Evans of Natural England, Worcester (Evans, 2015) lists aquatic plants recorded in the SSSI during a 1975 survey by P.A. Candlish and in a 1984 survey which has no named surveyor. Two surveys were undertaken by consultants in 2006. These were for English Nature of just the SSSI (Broughton, 2006) and for the Grantham Canal Partnership of the whole canal but in sections so that data for the SSSI are separable from the whole (Anon, 2007).

The SSSI citation described the open-water community as being characterized by free-floating plants such as Fat Duckweed and occasional Water Fern with typical submerged/floating-leaved plants being Rigid Hornwort, Canadian Waterweed and Broad-leaved Pondweed. More can be learnt about the likely composition of this community by reference to the 1975 and 1984 surveys. Common and Ivy-leaved Duckweeds were recorded in 1975, and Curled, Flat-stalked, Fennel and Lesser Pondweeds and Water-soldier in 1984. Additional submerged/floating-leaved plants were added in 2006, including Nuttall's Waterweed, Frogbit, White and Yellow Water-lilies, Blunt-leaved Pondweed and the stonewort *Nitella mucronata* (Broughton, 2006; Anon, 2007). Also, Pitman's (2007) guide to the canal refers to Grass-wrack Pondweed as not now found in the SSSI, implying that he had information that it was formerly there, although it was not found in the SSSI by the surveys cited herein. This plant was,

however, recorded in the canal east of the SSSI in 2006 (Anon, 2007). Thus, the open-water flora appears to have been species-rich and to have included up to seven species of pondweed.

Although submerged and floating-leaved plants continued to be hugely abundant in 2015 their species richness (Table 2) seemed to be less than formerly. Only two pondweeds were found, Curled and Fennel, and both were very scarce. The decrease in species richness of the open-water flora, with pondweeds probably being out-competed by more aggressive plants, seems to have been underway for some time. The July 2006 survey (Broughton, 2006) reported in places aggressive colonization by Water-soldier and elsewhere the dominance of Rigid Hornwort and duckweeds, while amongst pondweeds that survey found only Fennel Pondweed.

The 1981 SSSI citation described abundant and diverse emergent marginal vegetation dominated by stands of Common Reed, Branched Bur-reed and Bulrush supplemented locally by Flowering-rush, Water Horsetail and Arrowhead. By 2006 the emergent vegetation continued to be dominated by Common Reed in many places but otherwise there was a diverse emergent flora typified by Reed Sweet-grass, Branched Bur-reed, Bulrush and sedges; Flowering-rush was also frequently recorded (Broughton, 2006). The abundance and high species richness of emergent vegetation described at SSSI notification and by surveys up to 2006 (Broughton, 2006; Anon., 2007; Evans, *loc. cit.*) had evidently continued to 2015 (Table 2). Out of 20 JNCC-checklist emergent plants recorded in July 2006 (Broughton, 2006) only two, Common Spike-rush and Brooklime, were not found in 2015.

JNCC-checklist plants that were recorded in the Grantham Canal SSSI up to 2006 but were not found in 2015 are listed in Table 4. Eight submerged/floating-leaved plants have seemingly been lost. These included four pondweeds, Fat Duckweed and the alien Water Fern, although the latter was abundant west of the SSSI in 2015 (I. Wilde, personal communication). White and Yellow Water-lilies that were recorded in 2006 (Broughton, 2006; Anon, 2007) but not by the earlier surveys were not found in 2015. Amongst emergent plants, the apparent loss of Narrow-leaved Water-plantain and Tubular Water-dropwort is of conservation significance; neither of these was recorded in the 2006 surveys. Jeeves (*loc. cit.*) gives the VC55 status of the apparently lost plants. Of these: Narrow-leaved Water-plantain, Tubular Water-dropwort and Flat-stalked and Blunt-leaved Pondweeds are scarce, although Blunt-leaved Pondweed was reported for the Grantham Canal in 2007; Lesser Pondweed and Fat Duckweed are approaching scarce; Water Fern, White Water-lily, Broad-leaved Pondweed and Celery-leaved Buttercup are occasional. Jeeves also reports Grass-wrack Pondweed as rare but in the Grantham Canal as recently as 2007, although not necessarily in the SSSI. Jeeves expressed the opinion that deterioration of canal sites in VC55 over the previous 20 years had been so bad that none retained substantial botanical interest; there certainly appear to have been significant losses from the Grantham Canal SSSI (Table 4) but nevertheless the results of the 2015 survey (Table 2) suggest that much of value remains.

Table 2. The number of canal lengths in which aquatic plants (JNCC checklist species) were recorded: Chesterfield Canal, Cromford Canal and Grantham Canal SSSIs, May-September 2015

	Chesterfield Canal	Cromford Canal	Grantham Canal
Number of canal lengths surveyed	9	12	12
Submerged and floating-leaved plants			
Callitriche water starwort	0	9(7)	0
Ceratophyllum demersum Rigid Hornwort	0	2(1)	9(5)
Chara/Nitella stonewort	1	0	3
Crassula helmsii New Zealand Pigmyweed	0	2	0
Elodea canadensis Canadian Waterweed	0	2(1)	4
Elodea nuttallii Nuttall's Waterweed	0	1(1)	4
Fontinalis antipyretica Greater Water-moss	2	3(1)	0
Hydrocharis morsus-ranae Frogbit	0	0	7(1)
Lemna minor Common Duckweed[1]	8	10(6)	12(8)
Lemna trisulca Ivy-leaved Duckweed	6	4(1)	12(10)
Myriophyllum spicatum Spiked Water-milfoil	0	3(1)	0
Nuphar lutea Yellow Water-lily	3(1)	0	0
Nymphaea alba White Water-lily	0	1	0
Potamogeton berchtoldii Small Pondweed	0	2	0
Potamogeton crispus Curled Pondweed	2	2[3]	1
Potamogeton pectinatus Fennel Pondweed	9(7)	1[3]	1
Potamogeton natans Broad-leaved Pondweed	0	2(1)	0
Potamogeton pusillus Lesser Pondweed	5	0	0
Ranunculus circinatus Fan-leaved Water-crowfoot	0	2(2)	0
Ranunculus penicillatus ssp. *pseudofluitans* Stream Water-crowfoot	0	1	0
Sagittaria sagittifolia Arrowhead	1	0	2[4]
Sparganium emersum Unbranched Bur-reed	1	1	0
Stratiotes aloides Water-soldier	0	0	10(10)
Zannichellia palustris Horned Pondweed	1	0	2
Emergent plants			
Acorus calamus Sweet-flag	0	1	0
Agrostis stolonifera Creeping Bent	6	7	10
Alisma plantago-aquatica Water-plantain	0	2	4
Apium nodiflorum Fool's-water-cress	3	8	-
Berula erecta Lesser Water-parsnip	7	2	12(10)[5]
Butomus umbellatus Flowering-rush	0	0	8
Caltha palustris Marsh-marigold	0	1[3]	0
Carex acutiformis Lesser Pond-sedge	9(1)[2]	2	0
Carex pseudocyperus Cyperus Sedge	0	0	6
Equisetum fluviatile Water Horsetail	0	1	6(1)
Equisetum palustre Marsh Horsetail	0	1[3]	1
Glyceria maxima Reed Sweet-grass	9(7)	12(11)	10(1)
Iris pseudacorus Yellow Iris	8	5	4(1)

Juncus effusus Soft-rush	0	7	5
Mentha aquatica Water Mint	5	10	12
Myosotis scorpioides Water Forget-me-not	0	8	2
Nasturtium officinale agg. Water-cress	5	5	1
Persicaria amphibia Amphibious Bistort	8	0	12(1)
Phalaris arundinacea Reed Canary-grass	8	9	10
Phragmites australis Common Reed	3(2)	0	8(8)
Ranunculus flammula Lesser Spearwort	0	1	0
Ranunculus lingua Greater Spearwort	0	0	1
Ranunculus sceleratus Celery-leaved Buttercup	1	0	0
Rorippa amphibia Great Yellow-cress	0	6	0
Rumex hydrolapathum Water Dock	8	0	0
Solanum dulcamara Bittersweet	8	2	7
Sparganium erectum Branched Bur-reed	9(2)	4(3)	11(4)
Typha angustifolia Lesser Bulrush	0	0	1
Typha latifolia Bulrush	1	4	11(9)
Veronica beccabunga Brooklime	0	4	0

Values are the number of canal lengths in which each plant was recorded (infill indicates plants that were dominant or abundant in at least one length; values in brackets are the number of lengths in which these plants were recorded as dominant or abundant).

[1]Least Duckweed *Lemna minuta* may also have been present.

[2]Both Lesser Pond-sedge and Greater Pond-sedge *Carex riparia* were in the Chesterfield Canal but were not recorded separately.

[3]Records from May-August 2013.

[4]Arrowhead was an emergent plant in the Grantham Canal.

[5]Water-parsnip and Fool's-water-cress were not routinely separated in the Grantham Canal; the former was more abundant.

Table 3. Aquatic plants species richness and the sum of abundance scores for SSSI canal lengths.

Table 3.1. Chesterfield Canal, May-June 2015.

	Canal length									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Mean**
Number of species										
Submerged and floating-leaved plants	3	3	4	9	5	5	4	3	3	4.3
Emergent plants	11	10	10	11	9	9	12	12	14	10.9
All species	14	13	14	20	14	14	16	15	17	15.2
∑abundance scores										
Submerged and floating-leaved plants	5	4	5	12	8	10	6	5	5	6.7
Emergent plants	17	14	14	17	13	15	21	19	24	17.1
All species	22	18	19	29	21	25	27	24	29	23.8

Table 3.2. Cromford Canal, August-September 2015

	Canal length												
	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Number of species													
Submerged and floating-leaved plants	3	4	5	3	3	3	2	3	7	8	3	1	3.8
Emergent plants	6	14	14	9	6	7	9	12	9	4	6	4	8.3
All species	9	18	19	12	9	10	11	15	16	12	9	5	12.1
∑abundance scores													
Submerged and floating-leaved plants	7	6	11	8	8	7	6	8	8	18	7	3	8.1
Emergent plants	10	21	22	12	8	11	13	14	14	4	9	7	12.1
All species	17	27	33	20	16	18	19	22	22	22	16	10	20.2

Table 3.3. Grantham Canal, July-September 2015

	Canal length												
	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Number of species													
Submerged and floating-leaved plants	5	4	6	6	4	5	3	5	7	8	8	4	5.4
Emergent plants	12	12	6	12	14	12	11	9	13	14	14	15	12.0
All species	17	16	12	18	18	17	14	14	20	22	22	19	17.4
∑abundance scores													
Submerged and floating-leaved plants	12	9	14	14	11	12	9	11	12	13	11	12	11.7
Emergent plants	19	20	9	18	25	23	24	19	24	22	23	26	21.0
All species	31	29	23	32	36	35	33	30	36	35	34	38	32.7

Table 4. JNCC checklist aquatic plants seemingly lost from canal SSSIs since notification

Table 4.1. Chesterfield Canal

Plants recorded at SSSI notification and to 1993 but not in 2015	
Submerged and floating-leaved plants	**Emergent plants**
Azolla filiculoides Water Fern[3,4]	*Alisma plantago-aquatica* Water-plantain[2,4]
**Callitriche truncata* Short-leaved Water-starwort[1,2,3,4]	*Carex paniculata* Greater Tussock-sedge[1,2,3]
Elodea canadensis Canadian Waterweed[1,3]	*Carex rostrata* Bottle Sedge[2]
**Elodea nuttallii* Nuttall's Waterweed[1,2,3,4]	*Eleocharis palustris* Common Spike-rush[2,3,4]
Lemna gibba Fat Duckweed[3]	*Equisetum palustre* Marsh Horsetail[2]
**Myriophyllum spicatum* Spiked Water-milfoil[1,2,3,4]	*Glyceria fluitans* Floating Sweet-grass[2,3]
**Potamogeton berchtoldii* Small Pondweed[1,3]	**Juncus effusus* Soft-rush[2]
Potamogeton perfoliatus Perfoliate Pondweed[1,2,3,4]	*Myosotis secunda* Creeping Forget-me-not[2,4]
Potamogeton x lintonii Linton's Pondweed[1,2,3,4]	*Persicaria hydropiper* Water-pepper[2]
Ranunculus baudotii Brackish Water-crowfoot[1,2,3,4]	*Ranunculus lingua* Greater Spearwort[2]
	**Veronica beccabunga* Brooklime[2,3]
n of taxa=10	n of taxa=11

[1]Reported at SSSI notification 1987 (Natural England, 2016) and in [2]1986 (Alder, 1986), [3]1987 (Smith, 1987), [4]1993 (Anon, 1993). *Also recorded in a 2009 survey (Broughton, 2010) of the whole SSSI.

Table 4.2. Cromford Canal

Plants recorded at SSSI notification and to 2000 but not in 2013 or 2015	
Submerged and floating-leaved plants	**Emergent plants**
Ceratophyllum submersum Soft Hornwort[1,4] *Nitella* sp. stonewort[3,4] *Potamogeton compressus* Grass-wrack Pondweed[1,2] *Potamogeton gramineus* Various –leaved Pondweed[1] *Potamogeton pusillus* Lesser Pondweed[2] *Ranunculus omiophyllus* Round-leaved Crowfoot[1,3] *n* of taxa=6	*Alisma lanceolatum* Narrow-leaved Water-plantain[1,2] *Butomus umbellatus* Flowering-rush[1,2,3,4] *Eleocharis palustris* Common Spike-rush[3] *Glyceria fluitans* Floating Sweet-grass[2,3,4] *Menyanthes trifoliata* Bogbean[3] *Persicaria amphibia* Amphibious Bistort[2,3,4] *Persicaria hydropiper* Water-pepper[2] *Sagittaria sagittifolia* Arrowhead[2,3] *n* of taxa=8

[1]Reported at SSSI notification 1981 (Natural England, 2016) and in [2]1975 (Deadman & Pondlebury, 1976), [3]1979-1981 (Anon, 1981), [4]2000 (Anon, 2001).

Table 4.3. Grantham Canal

Plants recorded at SSSI notification and to 2006 but not in 2015	
Submerged and floating-leaved plants	**Emergent plants**
Azolla filiculoides Water Fern[1,3] *Lemna gibba* Fat Duckweed[1,2,3] *Nuphar lutea* Yellow Water-lily[5] *Nymphaea alba* White Water-lily[4,5] *Potamogeton friesii* Flat-stalked Pondweed[3] *Potamogeton natans* Broad-leaved Pondweed[1,2,3] *Potamogeton obtusifolius* Blunt-leaved Pondweed[5] *Potamogeton pusillus* Lesser Pondweed[3] *n* of taxa=8	*Alisma lanceolatum* Narrow-leaved Water-plantain[3] *Carex riparia* Greater Pond-sedge[3] *Eleocharis palustris* Common Spike-rush[2,4] *Glyceria fluitans* Floating Sweet-grass[3] *Oenanthe fistulosa* Tubular Water-dropwort[1,2] *Ranunculus sceleratus* Celery-leaved Buttercup[3] *Veronica beccabunga* Brooklime[4] *n* of taxa=7

[1]Reported at SSSI notification 1981 (Natural England, 2016) and in [2]1975 survey by P. A. Candlish (Evans, 2015), [3]1984 survey by an unnamed surveyor (Evans, 2015), [4]2006 (July) (Broughton, 2006), [5]2006 (August-September) (Anon, 2007).

Conclusions

This article describes work on three canal SSSIs and forms part of a wider study of seven canal SSSIs in the East Midlands and North of England. Discussion of these three canals will be integrated into a later article that will give an overview of the seven canals but nevertheless some interim conclusions can be drawn from the work that is reported here.

All three canal SSSIs were still relatively species-rich and, at least in places, had abundant aquatic vegetation, even though they have very different recent histories: the Chesterfield Canal being continuously navigable; the Cromford Canal being closed to navigation, in part restored, falling again into disuse and recently again having limited navigation; the Grantham Canal being long unnavigable. That said there were some obvious differences: the Chesterfield Canal had throughout an open central channel within which only Fennel Pondweed was generally abundant, along with much blanket weed; the Cromford Canal had extensive tree-shaded areas where vegetation was generally sparse; the Grantham Canal throughout had both a central channel with a more or less complete cover of submerged and/or floating-leaved plants and extensive margins of emergent vegetation.

The gross differences described earlier (Goulder, 2016) between the Leeds & Liverpool Canal and Huddersfield Narrow Canal SSSIs were not shown by these three canals. The number of species of submerged/floating-leaved plants was not greatly different with 11 in the Chesterfield Canal, 17 in the Cromford Canal and 12 in the Grantham Canal; nor were there great differences in the mean number of these plants per canal length with 4.3 (range 3-9) in the Chesterfield Canal, 3.8 (1-8) in the Cromford Canal and 5.4 (3-8) in the Grantham Canal (Table 3). The 17 emergent plants recorded in the Chesterfield Canal were fewer than the 22 found in both the Cromford Canal and Grantham Canal, although the mean number per length at 8.3 (4-14) was least in the Cromford Canal followed by 10.9 (9-14) in the Chesterfield Canal and 12.0 (6-15) in the Grantham Canal (Table 3). The total of 39 aquatic plants (submerged/floating-leaved and emergent) found in the Cromford Canal was rather more than the 34 in the Grantham Canal and 28 in the Chesterfield Canal.

Unlike the Leeds & Liverpool Canal and Huddersfield Narrow Canal (Goulder, 2016) gross differences in the mean sum of abundance scores (*∑AS*), an indicator of both species richness and abundance, were not found between these three canals. Mean *∑AS* per length for submerged/floating-leaved plants at 6.7 (4-12) was least in the Chesterfield Canal, reflecting the navigated open central channel, followed by 8.1 (3-18) in the Cromford Canal, partially shaded and with some recent dredging, and 11.7 (9-14) in the Grantham Canal (Table 3). Mean *∑AS* for emergent plants was least in the Cromford Canal at 12.1 (4-22), again perhaps reflecting shade and recent dredging, followed by 17.1 (13-24) in the Chesterfield Canal and 21.0 (9-26) in the Grantham Canal. The high mean *∑AS* for all water plants in the Grantham Canal at 32.7 (23-38), compared with 20.2 (10-33) in the Cromford Canal and 23.8 (18-29) in the Chesterfield Canal, emphasized the luxuriance of both submerged/floating-leaved and emergent vegetation that was found throughout that canal. Furthermore, although recent dredging of part of the Grantham Canal had perhaps favoured submerged and floating-leaved plants at the expense of emergent ones, the overall vegetation remained luxuriant throughout.

All three SSSIs have seemingly lost some plants since notification in the 1980s, although it is stressed that some inconspicuous or sparse plants may have been missed, especially because a grapnel was not used in the Cromford Canal and because only about 23% of the Chesterfield Canal and 86% of the Grantham Canal SSSIs were surveyed. In all three canals the apparent losses were roughly equal amongst submerged/floating-leaved plants and emergent plants (Table 4). Ten submerged/floating-leaved plants and 11 emergent plants were apparently lost from the Chesterfield Canal while losses were respectively six and eight from the Cromford Canal and eight and seven from the Grantham Canal. None of the apparent losses approached the 30 species, including 20 submerged/floating-leaved plants, that seem to have been lost from the Huddersfield Narrow Canal SSSI (Goulder, 2016).

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YNU Notice: Staff changes

We wish to record our grateful thanks to Ellen Tidy, who has recently retired as Membership Secretary, for her valuable and painstaking work. Membership correspondence should in future be addressed to:

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The bats of Rockley Tramway Tunnel

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Introduction
The wildlife interest associated with the legacy of the coal mining industry in South Yorkshire, particularly in the Barnsley area, is relatively well documented (Middleton, 2000; Lunn, 2001) but the subjects covered have not included nor indeed had any association with bats. The Rockley tramway tunnel of the former Silkstone Main Colliery is known to have been used by roosting bats since at least 1905. The tunnel, which dates from the mid-19th century is situated in Broomroyd Wood c.4.7km south-west of Barnsley town centre and 1km west of the M1 Motorway. The landscape of the area is typical of Natural Area 24 Coal Measures, characterised by dense populations centred on a number of towns and cities that developed largely as a result of the underlying coal fields. The topography of the Natural Area is gently undulating and the network of towns and cities is characterised by a matrix of ancient and secondary woodlands, valley wetlands, grasslands and mixed agriculture. Canals, mill-ponds and natural rivers are also important features. The Rockley and Stainborough area has an abundance of good foraging habitat for bats and consequently all of the locally occurring species are present. Charles Twigg (1853) said of the area “The neighbourhood of Barnsley abounds with picturesque beauty. In whatever direction we walk, scenery of a luxuriant and variegated richness unfolds itself”.

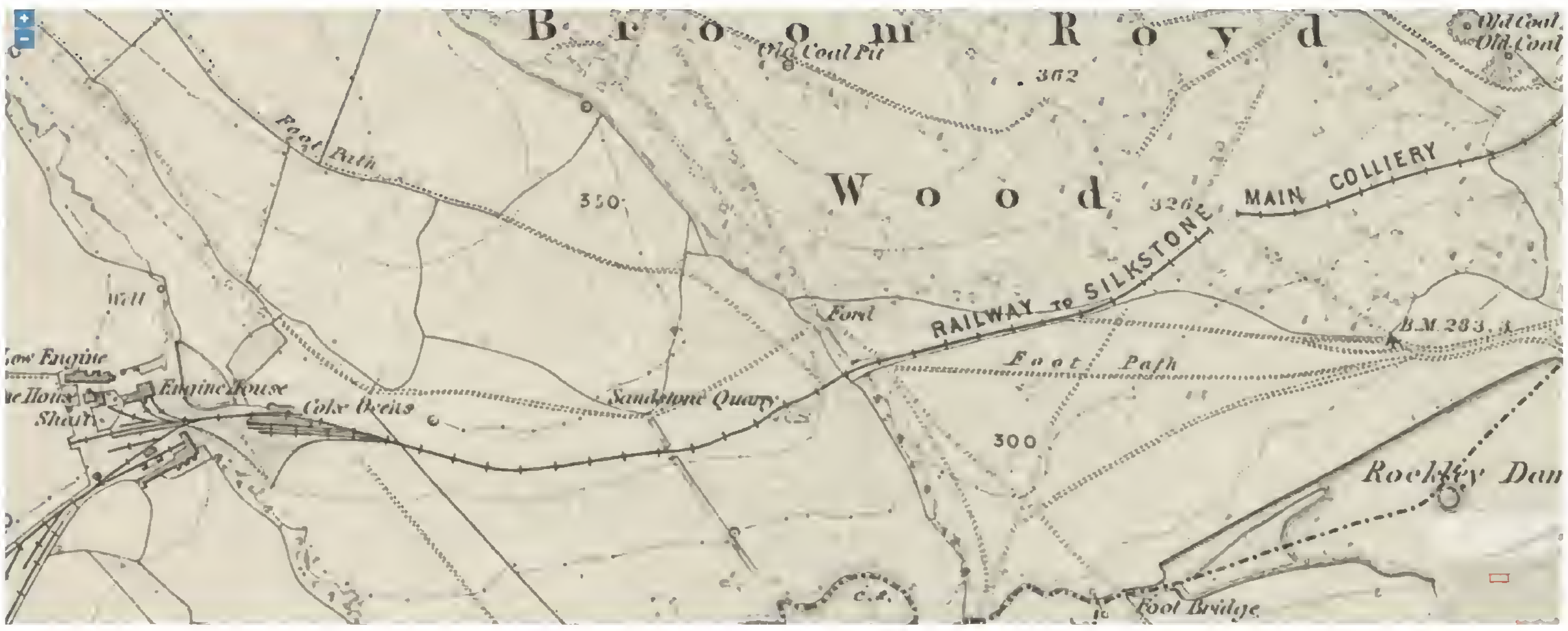

Figure 1. Section of 1842-52 map showing colliery and tramway tunnel (the tunnel, which is 25m in length, is the gap in the line between the words 'Silkstone' and 'Main').

The tunnel unfortunately has no historical designation, unlike nearby Rockley Furnace and Engine House which are Scheduled Ancient Monuments and, incidentally, also comprise important bat roost sites (Middleton, pers. comm.). The tunnel was formerly part of the railway that connected Silkstone Main Colliery, located c.800m west of Rockley Tunnel, to the railway line from Pilley Hills Colliery which then continued to the Worsbrough/Moor End branch of the South Yorkshire Railway (to the north-east) and eventually to the Dearne & Dove

Canal. The railway can be seen on the 6inch 1842-1852 OS Map (Figure 1) but the mine had closed by the 1892 survey. It was used for the transport of coal and goods and at one point along the length of the Rockley stretch the railway went up an incline, which suggests that it was indeed an animal-powered tramway rather than a railway.

The tunnel is 25m in length and a little over two metres wide with an inside height of two metres at its highest point (see Plate 4a , centre pages). It is built of the local sandstone in the drystone method by which structures are constructed from stones without any mortar to bind them together. Consequently, there is an abundance of suitable roosting features such as vertical and horizontal crevices and voids between stones at all elevations throughout its length. The entrance has a gated grill with the opposite end having been sealed off with the exception of an air ventilation hole which measures c.40cm x 40cm. The tunnel has been covered by a layer of earth with a minimum depth of c.15cm and a number of mature Yew trees now grow on top of the tunnel. Temperature checks undertaken at a set location in the middle of the tunnel during December-February hibernation survey visits carried out 2013-17 have recorded temperature fluctuations between 0 and 10.2°C with a mean of 4.4°C and a humidity range of 75-80% relative humidity. The stability of the humidity in the tunnel may indeed be an important factor influencing its suitability as a hibernaculum (van Schaik *et al.*, 2015). Unfortunately, there are now several holes in the roof of the tunnel where the stones have become dislodged and the long-term future of the tunnel is a serious concern.

The history of bat study at Rockley Tunnel

The Tunnel was first visited by the pioneer bat worker Arthur Whitaker during the Golden Era of bat studies at the beginning of the 20th century. The leading activists at that time were Charles Oldham and T.A. Coward but Arthur Whitaker and his friend Joseph Armitage (both lads from Barnsley) (Fig.2) were also significant contributors to the understanding of bats at the time (Whitely, *loc. cit.*). Their studies were first published in *The Naturalist* (1905–1913) and then later compiled and published in Whitely (1987). Arthur Whitaker was known to have collected bats from Rockley Tunnel as early as 1905 in order to study their behaviour in captivity. A specimen of the Brown Long-eared Bat *Plecotus auritus* dated 23 November 1905, almost certainly collected from the tunnel, is still included in the collection of Leeds Museum. Further specimens collected by Arthur Whitaker are held by Museums Sheffield and include a Natterer's Bat *Myotis nattereri* collected from the tunnel dated 15 November 1906 (See Plates 4b and 4c, centre pages).

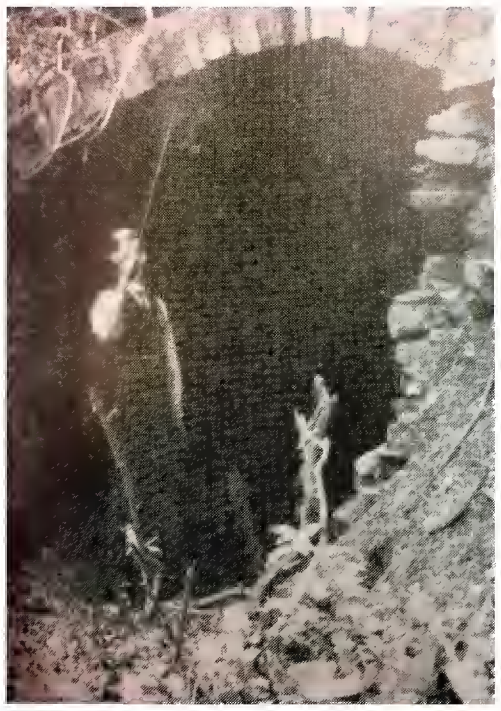

Figure. 2 Joseph Armitage at the entrance to Rockley tunnel.

The first modern day recording of bats at the site was c.1975 when Derek Whitely and Colin Howes 'rediscovered Whitaker's old tramway tunnel at Rockley' and a year later were joined by Mike Clegg on a joint Sorby/Y.N.U. field meeting to look at Daubenton's Bat *Myotis daubentonii* and Brown Long-eared Bat. As a result of this field trip, the bat conservationist Bob Stebbings inspected the tunnel and liaised with the then South Yorkshire County Council, which in turn organised the grilling of the entrance in 1978 (Whitely, *loc. cit.*). In the mid-1970s there was

very little focus on bats by naturalists and as few as 25 individuals took an active interest in Britain's bats (Stebbings, 1988). Local naturalist Gerry Brown visited the site on 27 July 1979 and recorded two Brown Long-eared Bats. There was then an absence of monitoring until 1983 when Gerry Brown again visited the site on eight occasions between April and December and recorded both Daubenton's and Brown Long-eared Bats, with a maximum of nine Daubenton's Bats during May. It was not, however, until 1987 when Eric Bennet began visiting the site that it was monitored on a regular basis, with survey effort and timing unfortunately varying considerably thereafter. Nevertheless, Rockley Tramway Tunnel has been almost continuously monitored to some degree from 1987 to the present day with the senior author undertaking hibernation surveys there for the Bat Conservation Trust (BCT) and South Yorkshire Bat Group since 2013.

Bat monitoring data 1975 to January 2017

Three species of bats have been recorded in the tunnel in every month of the year with the most abundant during this period being Daubenton's Bat with a total of 607 individuals recorded across all survey visits. The second most numerous bat encountered in the tunnel has been Natterer's Bat with a total of 277 recordings across all visits followed by Brown Long-eared Bat with only 60 individuals recorded. The largest single count of Daubenton's Bat was 30 individuals on 15 August 1992, whilst the largest count of Natterer's Bat at the site was 21 individuals recorded on 12 September 1998. Only small numbers of Brown Long-eared Bats have been found in the tunnel during this period with numbers typically between one and three, with a total of three bats recorded on only five occasions, four of which have been in the last two years (2015 to January 2017). In addition, there is a total of 45 unidentified bats, 22 of which were on the same date. Only on six occasions in 1975 and five times during the period from 2002 – 2004 out of the 224 visits made by various people (mainly Eric Bennet) between 1975 and January 2017 were bats not found. See Plates 4d and 4e, centre pages.

These numbers are probably not representative of the true abundance of the bats at the site because the data were not gathered systematically. Indeed, many years received only a single or low number of visits and, consequently, the dataset is somewhat incomplete. Nevertheless, Eric Bennet's dedicated work and valuable recording, especially in the 1990s, has provided a more complete dataset from which further insight into bat usage of the tunnel throughout the year is possible.

During 1995 the tunnel was monitored by Eric Bennet throughout the year, with survey data collected during each of the 12 months. During six of the additional years between 1989 and 2000 Eric visited the tunnel in all months except for one. This dataset is here considered separately to provide an overview of seasonal changes in bat usage. Table 1 and Figure 3 present the maximum count of each species within each month of the year across the seven years for which detailed data exist. The highest count was used in preference to the average count because there is a high likelihood that bats have remaining undetected in the dry stone walls of the tunnel during all surveys and the counts are in reality only a snapshot in time.

Table 1. Maximum monthly totals of each species - 1989 to 2000.

	January	February	March	April	May	June	July	August	September	October	November	December
Natterer's Bat	4	4	4	3	3	9	1	12	21	1	10	5
Daubenton's Bat	1	0	2	8	2	16	15	17	14	4	5	2
Brown Long-eared Bat	1	2	0	0	0	1	1	1	0	2	1	1

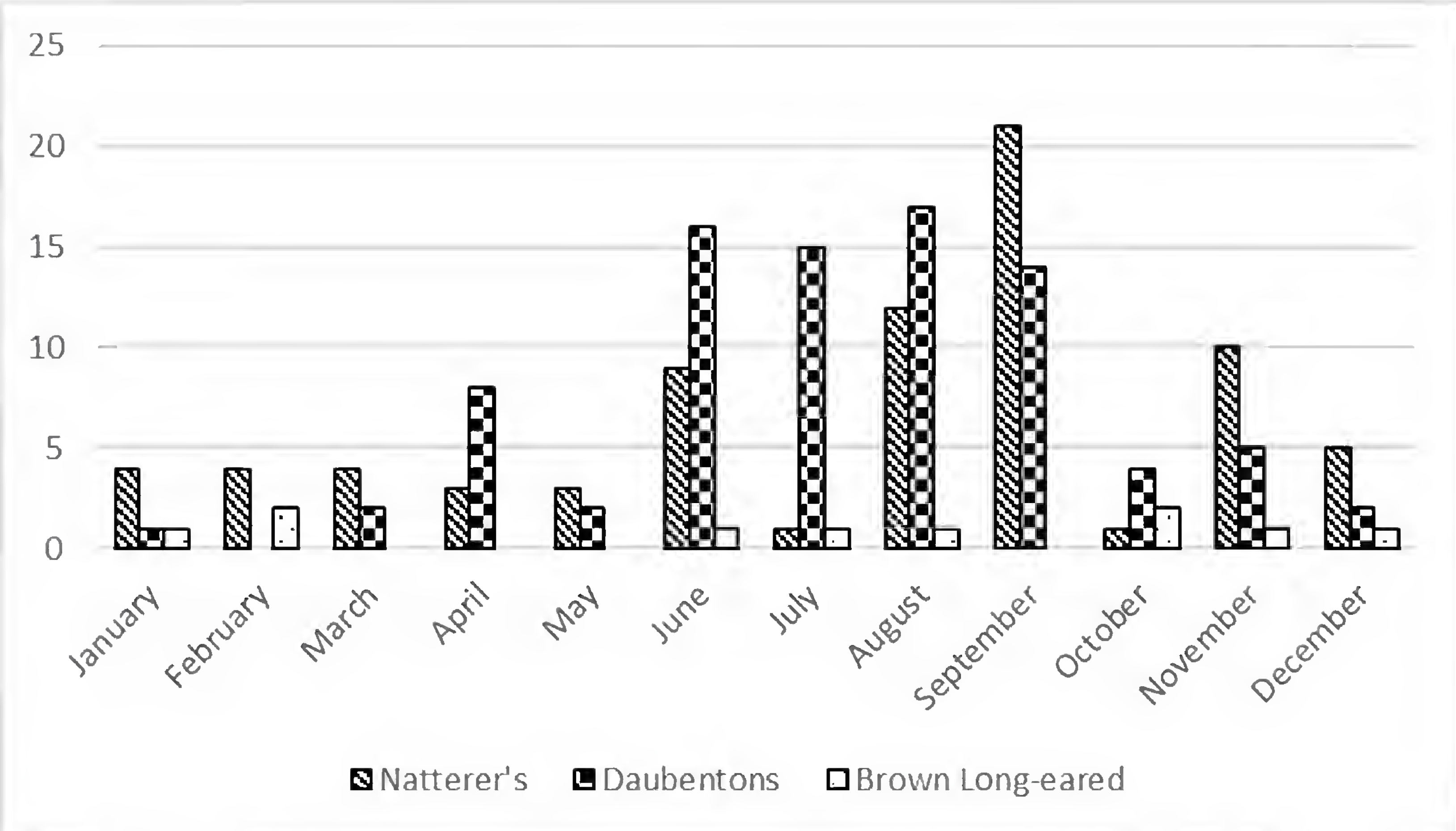

Figure 3. Maximum counts of each recorded species per month during 1989-2000

It is apparent from the whole dataset (1989–2016), and not just the period 1989–2000, that only low numbers of Brown Long-eared Bats are using the tunnel. There is, however, no significant seasonal difference in numbers because small numbers of one to three were found throughout the year.

Daubenton's Bat numbers in the tunnel appear to peak between June and September and, therefore, it appears that the tunnel supported a Daubenton's bat summer roost during the period 1989–2000. However, the pattern does not appear consistent in all years (mean 7.6 bats) and one needs to consider that the dataset used is incomplete. Nevertheless, the number of bats recorded from the tunnel during this period could be consistent with use by a nursery roost as Daubenton's Bat nursery roosts typically comprise 20-50 bats (Dietz *et al*, 2007), though large male colonies also commonly exist (Senior *et al*, 2005). Therefore, the use of the tunnel by Daubenton's Bats is still not fully understood, especially in recent times during which no summer monitoring has taken place.

Natterer's Bat numbers roosting in the tunnel during the period 1989–2000 appear to peak in September with relatively high numbers recorded intermittently during the summer period. There is a known maternity roost at a distance of 900m and the same colony perhaps intermittently uses the tunnel as this bat is known to move roosts frequently (Dietz *et al., loc. cit.*). The tunnel is, therefore, important for the local population of this species throughout the year but further research would give a better understanding of the tunnel in relation to the nearby maternity roost, which itself appears to be used only at the beginning of the nursery period (May).

Figure 4 shows variation in the number of bats of each species using Rockley Tunnel as a hibernaculum during 1993-2017. The numbers of bats using the tunnel as a hibernaculum during this period is consistent with recent monitoring and, whilst numbers of Daubenton's and Natterer's Bats are not as high as during summer and autumn, they are still high in comparison with other known hibernation sites in the region. During the winter period Rockley Tunnel is mainly used by Natterer's Bat and this can be clearly seen in Figure 4.

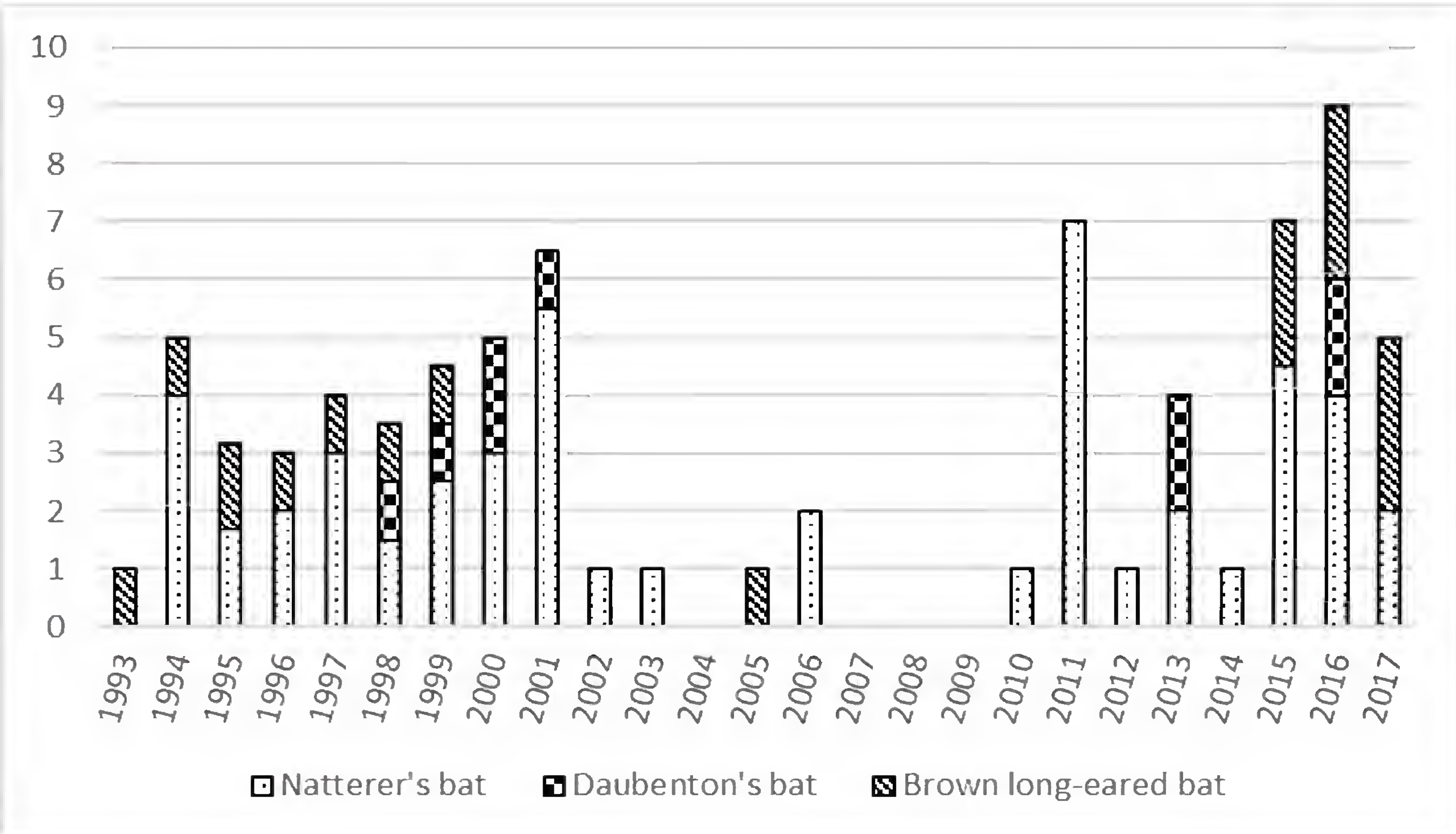

Figure 4. 1993-2017 annual means of December-February counts by species, including the 2007-2009 period during which no counts were undertaken

During winter, bats are mainly found in vertical gaps in the tunnel roof with a bias towards the main western portal, typically found singly but sometimes in small groups of up to five bats. Whiskered Bat *Myotis mystacinus* has never been found in the tunnel in spite of there being a known maternity roost less than two kilometres from the tunnel.

The tunnel is not a simple place to survey as there is an abundance of potential roost locations and many of the crevices or holes are deep, sometimes extending into a network of crevices,

some of which cannot be viewed. Consequently, in common with most hibernation sites, the number of bats recorded during surveys is likely to be significantly lower than the true number of bats using the structure at the time (van Schaik *et al.*, 2015). The authors estimate that the true number of bats using the tunnel during the hibernation period is likely to be higher than the total count (Glover & Altringham, 2008).

Numbers of bats recorded within both Rockley Tunnel and other hibernacula fluctuate in response to a number of variables including structure of hibernaculum, stage of the hibernation season, survey effort, external temperature and the number and competence of the surveyors. It has long been thought that the number of bats increases in winter during long spells of cold weather, however some of the higher winter counts have been during mild spells and this theory has not yet been robustly investigated.

To date, no surveys have been undertaken to determine the usage of Rockley Tunnel by autumn swarming bats and how this may influence its role as a roost site. Autumn swarming is characterised by intense bat flight activity in and around the entrances of underground sites, often by multi-species groups of bats. The autumn swarming period extends from approximately mid-August to mid-October, with swarming likely to fulfil a range of functions including facilitating gene flow (Rivers *et al.*, 2005), assessing hibernation sites ahead of roosting (van Schaik *et al.*, *loc. cit.*) and potentially adult-young transfer of information on roost sites (Glover and Altringham, *loc. cit.*). Bats are also known to occasionally roost within underground sites during the autumn swarming period (Rivers *et al.*, 2006). It is possible that bats recorded roosting within Rockley Tunnel during autumn may select the site to gain an advantage over other bats engaging in autumn swarming behaviour at the site.

Valuing Rockley Tunnel as a bat hibernaculum

The site has been registered in the BCT National Bat Monitoring Programme (NBMP) as a hibernaculum since 1987. In order to help understand the tunnel's importance as a bat hibernaculum, summary information was requested from the BCT for all monitored hibernation sites in the North of England.

The BCT kindly provided summary information relating to 68 hibernation sites, 17 of which were located in Yorkshire and Humber. With sites ranked by the maximum count of hibernating bats recorded (excluding pipistrelles), Rockley Tunnel ranks third of all sites in Yorkshire and Humber and seventh of all sites in the North of England. Of the two sites in Yorkshire and Humber with a higher maximum count than Rockley Tunnel, the top ranking site supported 24 bats whilst the second placed site supported 12 bats, as compared with the maximum count of 11 bats supported by Rockley Tunnel. The highest count recorded from any site in the North of England comprises 26 bats recorded from a site in the North-West.

When Rockley Tunnel's importance to hibernating bats is considered in light of the BCT NBMP data, it is proposed that the site may be valued as regionally important and clearly of importance at the county level.

When considering this assessment it should, however, be noted that it only takes into account those hibernation sites monitored as part of the NBMP, with other larger hibernation sites

likely to exist in Yorkshire, particularly in the limestone caves of the Yorkshire Dales and North York Moors. Survey work undertaken at known bat hibernation sites suggest that they frequently undertake autumn swarming and hibernation at the same sites (van Schaik *et al.*, *loc. cit.*). Studies have shown several of the North Yorkshire caves are heavily used by autumn swarming bats, with a number of these sites considered to be of up to national importance to nature conservation (Rivers *et al.*, 2006; Glover & Altringham, *loc. cit.*). Whilst not verified by winter counts, these caves are likely to support large numbers of hibernating bats and they are not reflected in the NBMP results supplied.

The future

The most important aim in the short term is to repair the holes in the ceiling of the tunnel in order to help secure the long term future of this site for bats. Secondly, summer monitoring should be resumed if only in the short term, in order to help determine current usage of the tunnel during the summer period and clarify the status of the Daubenton's Bat summer roost, if still present. In addition, there are plans to extend the South Yorkshire Bat Group Swarming Study which commenced in 2016 (Bell *et al.*, 2017 in preparation) to include harp trapping of Rockley Tunnel during the 2017 autumn swarming period. In the long term, research may include an in-depth study of Natterer's Bats in the local area in order to try and locate more of the roosts used by the resident community and to determine patterns of usage of what is likely to be a fission-fusion community, i.e. a colony that divides itself into constantly changing satellite or sub-colonies (Dietz *et al.*, *loc. cit.*). Given the site's history of bat study that extends back to 1905 and survey work in modern times covering a 30+ year period, the dataset collected from Rockley Tunnel is certainly unique within South Yorkshire. The rich history of bat study at Rockley Tunnel provides a motivation to further increase understanding of the site.

Acknowledgements

The authors are indebted to the dedicated work of Eric Bennet especially through the nineties, without his efforts this paper would not have been produced. Also, thanks to Derek Whitely of Sorby Natural History Society, Zac Nellist Archaeological Records Officer for South Yorkshire Archaeology, Alistair McLean of Museums Sheffield and Philip Briggs of BCT. The NBMP is run by Bat Conservation Trust in partnership with the Joint Nature Conservation Committee and supported and steered by Natural England, Natural Resources Wales, Northern Ireland Environment Agency and Scottish Natural Heritage. The NBMP is indebted to all volunteers who contribute data to the programme.

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Calomicrus circumfusus (Coleoptera: Chrysomelidae) in Yorkshire - a correction

R.J. Marsh

Whilst processing some record cards for Sorby NHS I became aware of a record of *Calomicrus circumfusus* (Marsham, 1802) (Coleoptera: Chrysomelidae) attributed to me from Ramsden Clough (SE1206) on 13 June 1981. The record was originally published in *The Naturalist* 107 (1982):106 in a report on YNU Excursions in 1981. I should point out that this species was recorded in error on that occasion and this should be borne in mind when consulting the report. To my knowledge we only have two records of *C. circumfusus* for Yorkshire, namely Hutton-le-Hole SE7089, 14 August 1993, R J Marsh; and New House Wood, Denby Dale SE2108, 8 August 1998, M L Denton. These would therefore be the first county and vice-county records (VCs 62 and 63 respectively). The erroneous Ramsden Clough record was repeated in Cox (2007), but the Hutton-le-Hole record was not included in that work.

The usual foodplant quoted in the literature is Gorse *Ulex europaeus*, and this was the plant recorded at Hutton-le-Hole. Nationally this is a scarce insect, recorded from the southern English coast north to the Firth of Forth.

Reference:

Cox, M.L. (2007) *Atlas of the Seed and Leaf Beetles of Britain and Ireland*. Pisces Publications, Newbury.

Plate 1. See p1.
Diamond-back moth
Plutella xylostella.
C. Fletcher

Plate 2. See p12. Two views of the Lealholm proboscidean tooth. *C. Pellant*

Plate 3. See p15.
3a. Chesterfield Canal, June 2015.
The navigated central channel has relatively sparse aquatic plants while the soft margins have extensive emergent vegetation.
R. Goulder

Plate 3b. Cromford Canal, September 2015.
The trough of Wigwell Aqueduct, where the canal crosses the River Derwent, has diverse submerged and floating-leaved vegetation, dominated by Broad-leaved Pondweed.
R. Goulder

Plate 3c. Cromford Canal, September 2015. The recently dredged channel, between wide margins of Reed Sweet-grass, is just navigable by a trip boat.

R. Goulder

Plate 3d. Grantham Canal, July 2015. The shallow channel is extensively colonized by Water-soldier and duckweeds.

R. Goulder

Plate 4 (see p33).
4a. Rockley Tunnel today.

R.A Bell

Plates 4b and 4c.
Natterer's Bat *Myotis nattereri* collected from Rockley Tunnel by Arthur Whitaker in 1906, with detail of accession label. Access to specimen kindly supplied by Museums Sheffield.

R.A Bell

Plates 4d and 4e. Natterer's Bat (left) and Brown Long-eared Bat *Plecotus auritus* in Rockley Tramway Tunnel. *P Middleton* (left) and *R. A Bell* (right).

Plate 5. Changes in bee abundance in Yorkshire (see p41).
The Tree Bumblebee *Bombus hypnorum (top left)* is a recent arrival to Yorkshire and therefore there are insufficient records for analysis. Gooden's Nomad Bee *Nomada goodeniana* (*top right)* has increased significantly in both recent and historical comparisons.
The Ashy Mining Bee *Andrena cineraria (lower left*) and Tawny Mining Bee *A. fulva (lower right)* have shown relatively stable populations throughout.
Photos from '*diggleken*' and *John Bowers* (lower right) via the YNU Flickr group.

Plate 6. See p48.
A hoverfly, probably *Eristalis tenax*, impaled on the leaf spine of a thistle.
R.O. Shillaker

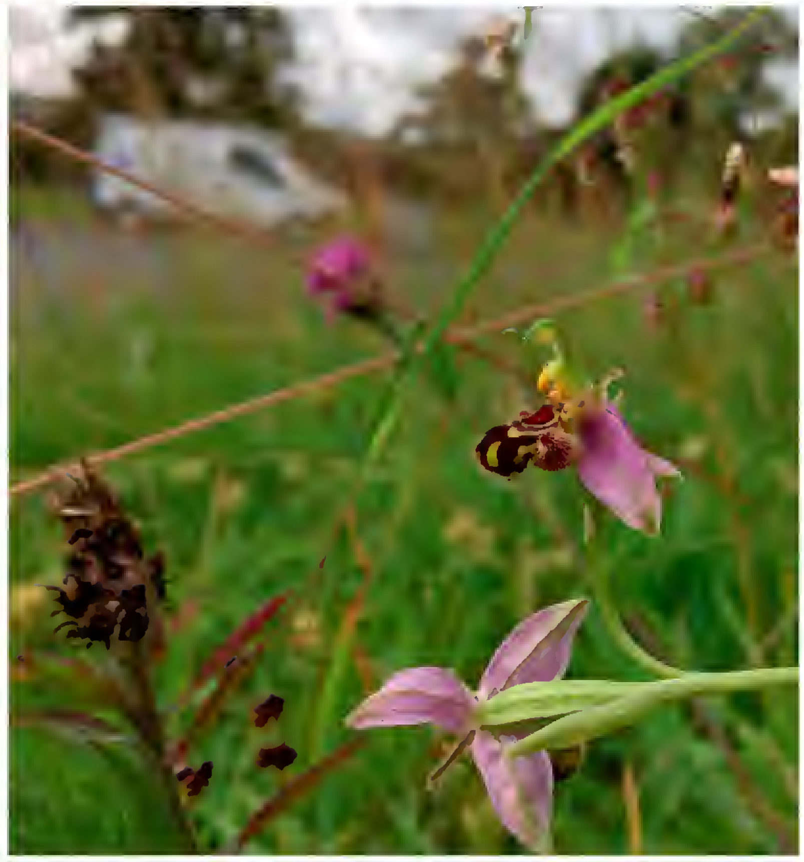

Plate 7. See p53.
Bee orchids *Ophrys apifera* growing on a roadside verge near Burley-in-Wharfedale.
R. Guppy

Plate 8.
YNU members attending the 2016 AGM at Fountains Abbey in November 2016. See p14 for details of the 2017 AGM.

Gains and losses of species abundances of bees of Watsonian Yorkshire

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Introduction

Recently there has been considerable concern about declines in bee communities in agricultural and natural habitats (Lebuhn *et al.*, 2012). Evison *et al.* (2012) found declines of honeybees and bumblebees in the U.K., Netherlands and North America. Biesmeijer *et al.* (2006) found declines of bees in Britain and the Netherlands when data from pre- and post-1980 were compared. With the development of the Yorkshire electronic database it is now possible to quickly access the species gains and losses of bees in Watsonian Yorkshire (Archer, 2014). It was found that from the all-time list of 116 solitary bees, the gain of 24 species from 1950 exceeded the overall losses of nine species dating back to the 19th century when recording began. In contrast, from the all-time list of 25 species of the social bees, seven (28%) have become extinct with only one gained from 1950.

Is it now possible to use the Yorkshire database to determine changes in the abundances of bees as represented by the number of records per species? This would seem unlikely as there has been no standard procedure of species recording. A preliminary attempt to compare the records of species of the Andrenidae between the first and second half of the 20th century found there was a significant correlation (0.63, $p < 0.01$, Spearman rank correlation, Archer, 2013) between the abundances of species between the two halves of the 20th century. The correlation coefficient is not 1.0 so some bees had undergone losses or gains.

The IUCN (2012) defined three categories of Threatened Species by means of six possible criteria. One of these criteria relates to species decline, with Critically Endangered species showing more than 80% decline over ten years, Endangered Species showing more than 50% decline over ten years and Vulnerable Species showing more than 50% decline over 20 years. Shirt (1987) also used a declining criterion for British insects as Endangered Species (rapid and continuous decline over 20 years) and Vulnerable Species (declining and likely to become Endangered in the near future). The IUCN also defined a category of Near Threatened for species that are close to qualifying for Vulnerable status.

The aim of this paper is to use the procedure developed by Archer (2013) for the families of solitary and social bees found in Yorkshire to determine species declines and increases in recent times, with reference to historical changes which further illuminate changes in recent comparisons.

Methods

The IUCN decline criterion is concerned with recent 10 and 20-year data. The Yorkshire database for recent years is insufficient to compare ten-year data sets so 20 year (1970-1989 versus 1990-2009) datasets have been compared (named 'recent comparison').

A comparison has also been made between recent times and early 20th century datasets. The Yorkshire dataset is variable and relatively sparse during the early 20th century, with the 40-year period of 1910-1949 (Archer, 2002, Table 4) having sufficient records to compare with the recent 40-year period of 1970 to 2009 (named 'historical comparison').

The procedure for comparing each two datasets was as follows:

1. The number of records for each species per family (solitary and social ones for the Apidae) in the recent and historical datasets was plotted against each other and Spearman's rank correlation test made to see if there was a significant correlation.

2. Since the total number of records in these two datasets were unequal the larger dataset was reduced species-by-species so that the total number of records was the same as the smaller data set using the formula:

   Total number of records in the smaller data set X each species total in the larger data set / total number of records in the larger data set.

   The reduced species data of the larger dataset were called 'reduced species data'.

3. Percentage increases and decreases between each species were calculated with the following formula:

   ((100 X each reduced species number of records / each smaller species number of records) – 100).

4. To determine if the percentage increase or decrease for each species was of statistical significance ($p = 0.05$ or less) a chi-square test was carried out for each species of the smaller data set and the reduced species data. For each species comparison if the smaller number of species or the reduced number of species is less than five the test is unreliable.

5. For each species, the percentage increase or decrease of the recent comparison and historical comparisons were determined.

6. Species where a statistical test could be applied were divided into three groups. First, species showing 50% or more losses or decrease in abundance will be considered as being in an unfavourable condition and species with 50% or more gains in abundance as being in a favourable condition. Second, species showing 45-49% loss in abundance will be considered as being in a near concern condition or if showing 45-49% gain in abundance as being in a near favourable condition. Third, species showing less than 45% losses or gains in abundance will be considered as being in a relatively stable condition.

Results and Analysis

The number of records per species for the historical and recent comparisons and species analysis is shown in the Appendix, at http://www.ynu.org.uk/naturalist.

The following four of the 141 bee species available (Archer, 2014) were excluded: Clover Blunthorn Bee *Melitta leporina* being the only species in the family of Melittidae ever recorded in Yorkshire, Honey Bee *Apis mellifera* as it is an anthropogenic bee and Reed Yellow-face Bee *Hylaeus pectoralis* which, with Cryptic Bumblebee *Bombus cryptarum,* was discovered in the 2010s which is outside the scope of this study.

Table 1 shows the number of species per family that could be used for the Spearman rank correlation test. 106 (76.8%) of the 138 bee species could be used for the recent comparison and 105 (76.1%) for the historical comparison. The Spearman correlation coefficient was statistically significant for all families, although generally the significance level was lower for the historical comparison (Table 1).

Table 1. The Spearman correlation test applied to each bee family for each time comparison.

Family	Number of species available	1970-1989 v. 1990-2009 Recent comparison		1910-1949 v. 1970-2009 Historical comparison	
		No. species	P	No. species	P
Colletidae	9	9	<0.01	6	<0.05
Andrenidae	36	29	<0.01	27	<0.05
Halictidae	32	23	<0.01	22	<0.01
Megachilidae	16	11	<0.01	13	<0.05
Solitary Apidae	21	19	<0.01	18	<0.01
Social Apidae	24	15	<0.01	19	<0.05
Total	**138**	**106**		**105**	

Table 2. Results of Chi-squared tests to determine whether the changes were statistically significant.

	Chi-square possible	Chi-square not possible	Comparison not possible	Total
Recent Comparison				
Colletidae	5	4	0	9
Andrenidae	22	7	7	36
Halictidae	22	1	9	32
Megachilidae	8	3	5	16
Solitary Apidae	14	5	2	21
Social Apidae	12	3	9	24
Total	**83**	**23**	**32**	**138**
Historical Comparison				
Colletidae	3	3	3	9
Andrenidae	20	7	9	36
Halictidae	15	7	10	32
Megachilidae	4	9	3	16
Solitary Apidae	13	5	3	21
Social Apidae	11	8	5	24
Total	**66**	**39**	**33**	**138**

Table 2, also by family, uses chi-squared tests to determine whether the measured percentage changes are statistically significant. It shows the number of species where a statistical test was possible or not and where no comparison could be made because of a lack of data. Forty-two species showed 50% or more losses or gains in abundance and eight bees showed 45-49% losses or gains in abundance as follows (Table 3):

Table 3. The species that could be statistically tested showing 45% or more changes in abundance.

Losses			Gains		
Recent and Historical Comparison	**Only Recent Comparison**	**Only Historical Comparison**	**Recent and Historical Comparison**	**Only Recent Comparison**	**Only Historical Comparison**
Near Concern	Near Concern	Near Concern	Favourable	Favourable	Favourable
Andrena lapponica	*Colletes succinctus*	*Sphecodes hyalinatus*	*Colletes daviesanus*	*Hylaeus hyalinatus*	*Andrena chrysosceles*
Andrena ruficrus	*Andrena clarkella*	*Nomada ruficornis*	*Andrena minutula*	*Andrena bicolor*	*Andrea nigroaenea*
Bombus monticola	*Andrena praecox*	*Bombus bohemicus*	*Halictus tumulorum*	*Andrena humilis* (RD)	*Andrena subopaca*
	Lasioglossum rufitarse	*Bombus campestris*	*Nomada goodeniana**	*Lasioglossum leucopus*	*Lasioglossum smeathmanellum*
	Megachile circumcincta		*Anthophora furcata*	*Lasioglossum leucozonium* (RD)	*Sphecodes gibbus*
	Nomada striata		*Bombus vestalis*	*Lasioglossum villosulum*	*Sphecodes pellucidus*
				Sphecodes crassus (N)	*Megachile willughbiella*
				Sphecodes ephippius	*Nomada leucophthalma*
				Sphecodes puncticeps (N)	*Nomada rufipes*
				Osmia leaiana	*Epeolus cruciger*
				Osmia rufa	*Bombus lapidarius*
					Bombus pascuorum
	Near Concern	Near Concern		Near Favourable	Near Favourable
	Lasioglossum fratellum	*Andrea fuscipes*		*Andrena chrysosceles*	*Andrena bicolor*
	Sphecodes hyalinatus			*Epeolus cruciger*	*Sphecodes geoffrellus*
					Nomada flavoguttata

*see Plate 5, centre pages

Important points from these tables are:

- Three bees showed 50% or more losses in abundance in the recent and historical comparisons. The near concern status has continued from the historical to the recent comparisons.

- Six bees showed losses of 50% or more in abundance only in the recent comparisons. In the historical comparisons, except for Black-headed Leafcutter Bee *Megachile circumcincta*, they showed changes in abundance of less than 45% and so can be considered relatively stable. A statistical test was not possible for Black-headed Leafcutter Bee due to lack of data. These bees, often stable in the historical comparison, now have near concern status in the recent comparison.
- Four bees showed losses of 50% or more in abundance only in the historical comparison. In the recent comparisons, statistical tests could be applied when changes in abundance of less than 45% were shown, so can be considered relatively stable. The near concern status of the historical comparison has been halted, being stable in the recent comparison.
- Six showed 50% or more gains in abundance in the recent and historical comparisons. The favourable status has continued from the historical to the recent comparisons.
- Eleven bees showed 50% or more gains in abundance only in the recent comparisons. In the historical comparisons three bees could be statistically tested showing changes of less than 45% in abundance so they can be considered relatively stable (White-footed Furrow Bee *Lasioglossum leucopus,* Red Mason Bee *Osmia bicornis*) or gains in abundance of 45-49%, being near favourable (Gwynne's Mining Bee *Andrena bicolor*). Two bees only had data for the recent comparisons so can be considered relatively new (N in Table 3) bees for Yorkshire. The remaining seven could not be statistically tested in the historical comparison although two of them were only recorded during the 1900s so can be considered re-discovered (RD in Table 3) species. The re-discovered and relatively new bees have become established with a favourable status. The others have also improved their status in the recent comparisons.
- Twelve showed 50% or more gains in abundance only in the historical comparison. All of these could be statistically tested in the recent comparisons with changes of less than 45%, so can be considered relatively stable. The favourable status of these bees in the historical comparisons has been halted in the recent comparisons.
- The eight that showed a near concern or favourable status can be analysed into six groups. First, the near concern status of Heather Mining Bee *Andrena fuscipes* in the historical comparison was halted to a relative stable status in the recent comparison. Second, the near concern status of Furry-bellied Blood Bee *Sphecodes hyalinatus* in the recent comparison was an improvement from the 50% or more loss of abundance in the historical one. Third, the near concern status of Smooth-faced Furrow Bee *Lasioglossum fratellum* in the recent comparison was a loss of abundance from the relative stable status in the historical comparison. Fourth, the near favourable status of Hawthorn Mining Bee *Andrena chrysosceles* and Red-thighed Epeolus *Epeolus cruciger* in the recent comparison was a loss in abundance compared with the 50% or more gain in abundance in the historical one. Fifth, the near favourable status of Geoffroy's Blood Bee *Sphecodes geoffrellus* and Little Nomad Bee *Nomada flavoguttata* in the historical comparison has been halted to a relatively stable status in the recent one. Lastly, the near favourable status of Gwynne's Mining Bee in the historical comparison has been improved to 50% or more gain in abundance in the recent comparison.

The remaining bees that could be statistically tested showed changes in abundance of less than 45% (Table 4) and can be considered to have relatively stable status. Twenty-nine of them showed changes in abundance of less than 45% in both the recent and historical comparisons and eight

only in the recent comparison. A historical comparison was not possible for these eight because of lack of data.

Table 4. The species that could be statistically tested and showed less than 45% losses or gains in both the recent and historical and only the recent comparisons.

Recent and historical			Recent only
Hylaeus communis	*Andrena tarsata*	*Nomada fabriciana*	*Hylaeus confusus*
Andrena barbilabris	*Andrena wilkella*	*Nomada lathburiana*	*Andrena helvola*
Andrena cineraria *	*Halictus rubicundus*	*Nomada marshamella*	*Lasioglossum fulvicorne*
Andrena denticulata	*Lasioglossum albipes*	*Nomada panzeri*	*Lasioglossum punctatissimum*
Andrena fucata	*Lasioglossum calceatum*	*Epeolus variegatus*	*Chelostoma florisomne*
*Andrena fulva**	*Lasioglossum cupromicans*	*Bombus hortorum*	*Megachile versicolor*
Andrena haemorrhoa	*Lasioglossum nitidiusculum*	*Bombus lucorum*	*Nomada integra*
Andrena scotica	*Sphecodes monilicornis*	*Bombus pratorum*	*Bombus magnus*
Andrena semilaevis	*Osmia caerulescens*	*Bombus sylvestris*	
	Megachile centuncularis	*Bombus terrestris*	

*see Plate 5, centre pages

The bees that could not be statistically tested or where no comparisons could be made include 16 extinct species (Archer, 2014) and a further 17 relatively new species to Yorkshire (Table 5).

Table 5. New, Re-Discovered and Extinct species which could not be statistically tested.

New	**Extinct**
Hylaeus signatus	*Andrena labiata*
Colletes halophilus	*Andrena pilipes*
Andrena nitida	*Andrena thoracica*
Andrena ovatula	*Panurgus banksianus*
Andrena similis	*Lasioglossum laevigatum*
Andrena synadelpha	*Lasioglossum parvulum*
Andrena tibialis	*Lasioglossum quadrinotatum*
Lasioglossum minutissimum	*Sphecodes miniatus*
Lasioglossum pauxillum	*Coelioxys quadridentata*
Sphecodes reticulatus	*Bombus distinguendus*
Anthidium manicatum	*Bombus humilis*
Stelis punctulatissima	*Bombus ruderarius*
Osmia spinulosa	*Bombus ruderatus*
Nomada flava	*Bombus soroeensis*
Nomada flavopicta	*Bombus subterraneus*
Nomada fulvicornis	*Bombus sylvarum*
*Bombus hypnorum**	

*see Plate 5, centre pages

Discussion

The lower probability levels of the Spearman's test for the 1910-1949 v. 1970-2009 comparison (Table 1) would be a consequence of the lower number of species which could be tested statistically (Table 2).

For the bees that could be successfully statistically tested in the recent comparison there are a similar number of losses (26) and gains (24) (Table 3). There were 37 bees (Table 4) that also could be successfully statistically tested that can be considered relatively stable There are similar numbers of extinct (16) to new and re-discovered (17) bees (Table 5). This would seem to indicate that, although the actual species present in Yorkshire are variable over the longer time, the number of species remains relatively constant.

Baldock (2008) compared the current abundance of bees in Surrey with the casual comments of Saunders (1902) and found that c.80% of bee species had possibly or probably increased in abundance or remained at a similar abundance while c.20% had possibly or probably declined in abundance or become extinct. Comparative data for Yorkshire can be calculated by adding the 24 gains (Table 4), 37 stable (Table 4) and the 17 new and re-discovered bees (Table 5), which gives 78 bees (65%). Adding the 26 losses (Table 3) to the extinct (Table 5) bees gives 42 bees (35%).This would seem to indicate that the Yorkshire bees are not doing as well as the Surrey bees.

The bees showing an increase in abundance and the relatively new bees are considered to be due to a northwards extension of species distributions usually explained by the occurrence of more favourable weather resulting in the increased movement of insects (Unwin & Corbett, 1991) and to the activities of three individuals who have recently explored most of Yorkshire (Archer, 2014).

Seven bumblebees have become extinct with only one new. The loss for the bumblebees can be related to the loss of habitat due to intensive farming, resulting in the removal of hedgerows, increased drainage and the use of pesticides (Benton, 2006; Goulson, 2010). These changes would result in the loss of subterranean and surface-level nesting sites and the interruption of the insects' continuous need for flowers for pollen and nectar sources from April until September.

The reasons for extinctions of the solitary bees are generally unknown although the site where the Large Shaggy Bee *Panurgus banksianus* was recorded has been lost to urban development and playing fields. The other bees are now distributed well south or are near the southern border of Yorkshire (Archer, 2014).

The nine bees showing recent losses in abundance of 50% or more (Table 3) can be considered Vulnerable (IUCN, 2012). These bees are usually associated with moorlands and heathlands. Similarly, the 17 bees showing 50% or more recent gains in abundance (Table 3) can be considered as particularly successful bees. The relatively new bees (Table 3) will probably be widespread Yorkshire species in the future. In contrast, the relatively new solitary bees (Table 5) need to be particularly monitored to discover if they remain rare, become extinct or become more widespread. For example, Spined Mason Bee *Osmia spinulosa* has probably become

extinct at its only known site of Wharram Quarry while Large Yellow-face Bee *Hylaeus signatus*, Brassy Mining Bee *Lasioglossum morio*, Flavous Nomad Bee *Nomada flava* and Tree Bumblebee *Bombus hypnorum* (see Plate 5, centre pages) have shown an increase in abundance during the 2010s.

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Field note: Drone Fly impaled on thistle

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On 27 July 2016 I joined a small group visiting Skerne Wetlands, the new Yorkshire Wildlife Trust reserve near Driffield. One of our party spotted an insect, which resembled a bee or hoverfly, impaled on the leaf spine of a thistle. The impaled insect was located low down on the thistle plant. Photographs of this curiosity were taken but the insect, which appeared to be motionless, was not closely inspected and no attempt was made to remove it from the leaf spine. No other impaled insects were noted on the thistle.

A photograph (Plate 6, centre pages) of the impaled insect was posted on iSpot; this led to a response from Ian Andrews who suggested that the insect was likely to be the Drone Fly *Eristalis tenax,* a hoverfly which mimics the Honey Bee (identification confirmed by Bill Ely).

The photograph shows that the thistle spine had pierced the dorsal surface of the abdomen just anterior to the second abdominal segment, possibly penetrating soft tissue between the first and second abdominal segments.

As the Hoverfly was found quite low down on the thistle it would seem unlikely that it had been impaled by a shrike. It is more likely that the hoverfly accidentally flew onto the spine, perhaps being blown by a gust of wind. Crellin (2011) also suspected that an untimely gust of wind was the reason for finding flies impaled on the tips of Marram Grass *Ammophila arenaria*. The presence of flies impaled on Marram Grass has also been observed by Bill Ely (*pers comm.).* The same explanation has been proposed (Irwin, 2011) for the finding of a cluster fly impaled but alive on a thorn; Irwin noted the absence of other damage to the insect which might be expected if it had been impaled by a shrike. Another photograph of an intact fly impaled on a plant spine (of a thistle in the Wyre Forest, Shropshire) was provided by O'Neill (2011), who suspected that in struggling to release itself the fly became further imbedded on the spine. Although the photograph of the hoverfly at Skerne only shows part of the insect the absence of other extensive damage is notable, which is consistent with accidentally flying onto the thistle spine.

Just as I was completing this short note, Ian Andrews drew my attention to another photograph apparently of *Eristalis tenax* impaled on a sharp tip of a plant, possibly a rush stem (posted on The Insects of Britain and Northern Europe Facebook site by Barnett, 2016). In this case the 'rush' had pierced the head of the hoverfly, with the tip of the stem protruding from the other side of the insect. This might also have been the result of an accidental collision with the plant because the 'rush' would have been too weak to support the weight of a shrike.

The Facebook posting by Barnett resulted in a string of comments including a photograph by Gordon Woolcock of a Ringlet Butterfly *Aphantopus hyperantus* impaled on a Gorse *Ulex europaeus* spike. The impaled butterfly, which was reported to be alive, was unlikely to have been impaled by a shrike because it was several feet inside the bush and showed only limited damage to one wing.

To conclude, there are several reports of insects impaled on the spine/sharp tip of a plant apparently a result of accidentally flying onto the spine.

Acknowledgements

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Species-rich neutral grassland management on roadside verges in Burley-in-Wharfedale, West Yorkshire

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Introduction

Urbanisation and intensification of agriculture have caused a dramatic loss in the cover of semi-natural habitats across Britain in recent decades. Semi-natural grasslands have seen some of the greatest declines and are estimated to have reduced by 97% in England and Wales between 1930 and 1984 (Fuller, 1987) and by 47% in England between 1960 and 2013, largely due to agricultural intensification (Ridding *et al.*, 2015). Such grasslands are of great importance for a range of different species including plants, invertebrates, birds and small mammals, and require continual management by cutting or grazing to prevent natural succession into scrub and woodland (Ridding *et al., loc. cit*). Lowland Meadows are a Priority Habitat for nature conservation listed on Section 41 of NERC Act 2006 and, as of 2007, roadside verges supporting this habitat are also included in the definition (JNCC, 2008).

Roadside verges often require the management of trees and shrubs to maximise visibility for road users and so have the potential to support grassland habitats. If correctly managed, these grasslands can support many of the wildflowers associated with species-rich lowland meadows. Such grasslands not only provide aesthetic interest to road users and local residents but also provide valuable habitats for wildlife and provide ecological corridors in the wider landscape, linking otherwise isolated and fragmented habitats.

The objective of this study was to monitor the effects of hay-meadow-style management of roadside verges on their ecological value as species-rich grassland, based on their botanical species richness and composition, to determine whether such management practices can be used to create and maintain lowland meadow habitats along roadside verges.

Methods

Burley-in-Wharfedale is situated in Lower Wharfedale, West Yorkshire, centred on OS grid reference SE167461. The vegetation communities monitored in this study consist of grasslands on the roundabouts and verges of the Burley-in-Wharfedale Bypass and adjacent roads. These roads were completed in April 1995 and the verges were variously seeded, with most of those sampled thought to have received a 'wild flower meadow' seed mixture following advice from local naturalists. Where a wildflower seed mix was not applied, it is assumed that a standard roadside verge seed mixture was used based on Perennial Rye-grass *Lolium perenne*.

Subsequently, typical roadside verge management comprising frequent mowing was implemented by Bradford Council. However, local residents noticed that the wildflowers along the verges were declining under this management, so the Burley Village Wildlife Group, in partnership with the Burley Parish Council, petitioned for more sympathetic management with reduced cutting of the sward.

Bradford Council commenced hay-meadow-style management of the verges in 2004, with the sward left to grow between March and June to allow plants to seed each year. Highway 'sight-lines' then receive a cut in late July for traffic safety reasons, with the verges receiving a full cut in late October. Arisings have been removed from areas along the verge that were considered to be the most biodiverse since 2007. Whilst no grazing by domestic livestock takes place, occasional grazing by Rabbit *Oryctolagus cuniculus* and Roe Deer *Capreolus capreolus* is likely throughout.

To monitor the effects of this management on botanical species richness, abundance and composition of the verges, the Burley Parish Council funded two National Vegetation Classification (NVC) surveys; a baseline survey in 2010 and a repeat assessment in 2016. Surveys were undertaken between June and July each year during the peak flowering period for grassland plants and before the first cut.

The method used for these surveys follows the approach for NVC survey as described by Rodwell *et al.* (1992) and Rodwell (2006). During the baseline survey eight verges along the Bypass were sampled with up to five vegetation samples assessed in each. Data were gathered by laying out 2x2m quadrats to record the abundance and frequency of all plants present. The locations of these quadrats were recorded using a ten figure Ordnance Survey (OS) grid reference. During the repeat assessment these quadrat locations were re-found as accurately as possible using handheld Garmin GPSMAP 62 devices.

Within each quadrat/sample all species of vascular plants and bryophytes were identified and the percentage cover within the quadrat was estimated for each. In addition, a full species list for each community was made including species not featuring in the quadrats, and an indication of abundance throughout the verge recorded using the DAFOR scale (Dominant, Abundant, Frequent, Occasional or Rare for the community). The figure for percentage cover for each plant in each quadrat was recorded as a Domin value, as described by Rodwell *et al.* (*loc. cit*.).

Following field survey, and for the purposes of relating the verge to community descriptions in the NVC, the frequency of each plant in each verge area was calculated. The NVC community type was determined by comparing the results of the field survey, using both keys and the experience of the field surveyor, with reference to the published accounts and floristic tables in British Plant Communities (Rodwell *et al., loc. cit.*).

The plants most characteristic of species-rich grasslands were then assigned a score of one or two, the latter being ones that are rare or uncommon, following the criteria used in the selection of Local Wildlife Sites in West Yorkshire (West Yorkshire Ecology, 2011). The sum of these scores was then calculated to provide the 'Total Botanical Score' for each verge and the difference between these scores for each year of survey used to provide a quantitative indication of the direction and degree of change in each verge's ecological value over the monitoring period.

Results

Species-rich grassland MG5 *Cynosurus cristatus-Centaurea nigra* grassland, including MG5a *Lathyrus pratensis* sub-community and MG5b *Galium verum* sub-community, was identified at seven of the verges during the baseline survey, and in all eight verges in the repeat assessment (Table 1).

In addition, species-poor grassland communities including MG1 *Arrhenatherum elatius* grassland, MG1a *Festuca rubra* sub-community and MG1b *Urtica dioica* sub-community; MG6b *Lolium perenne-Cynosurus cristatus* grassland: *Anthoxanthum odoratum* sub-community; and MG7e *Lolium perenne–Plantago lanceolata* grassland were identified at four of the verges in 2010 and at two of the verges in 2016 (Table 1).

Table 1. NVC communities identified at each roadside verge in 2010 and 2016.

Verge No.	NVC Communities	
	2010	**2016**
1	MG5b	MG1a, MG5
2	MG1, MG5, MG5b	MG5, MG5b
3	MG5	MG5b
4	MG5, MG6b	MG5a
5	MG1b, MG5a, MG5b	MG5a
6	MG1, MG1b, MG5b	MG5, MG5b
7	MG5	MG5
8	MG1, MG7e	MG1a, MG5a

This indicates that the occurrence of species-rich neutral grassland on the study verges has increased from 87.5% of the study verges in 2010 to 100% by 2016, although two of the verges (Verges 1 and 8) still comprise a mosaic with more species-poor communities. Conversely, the occurrence of more species-poor grassland communities on the study verges had decreased from 50% of the verges in 2010 to 25% in 2016.

The Total Botanical Scores indicate that five (62.5%) of the study verges have seen an increase in plants most characteristic of species-rich grasslands between 2010 and 2016 (Table 2).

Table 2. Total Botanical Scores of each roadside verge in 2010 and 2016.

Verge No.	Total Botanical Scores		
	2010	**2016**	**Change**
1	10	5	-5
2	7	7	0
3	6	8	2
4	6	9	3
5	7	11	4
6	8	11	3
7	7	8	1
8	6	4	-2
Entire Site	13	16	3

Two of the verges have seen a decrease in plants most characteristic of species-rich grasslands between 2010 and 2016. Verge 1, which had the greatest Total Botanical Score of the verges in 2010, has decreased by 50% during the study period. The Total Botanical Score for the entire site (combining all eight verges) has increased between 2010 and 2016 (Table 2).

Discussion

The results of this study suggest that hay-meadow-style management is having a positive effect on the ecological value of the study roadside verges along the Burley-in-Wharfedale Bypass. The occurrence of species-rich neutral grassland NVC communities along the roadside verges has increased within the monitoring period and the Total Botanical Scores, based on the number of plants most characteristic of species-rich grasslands, have increased in the majority of study verges within the monitoring period.

The Total Botanical Scores of two of the verges have decreased during the study period, with Verge 1 showing a decrease by 50%. During the assessment in 2016 it was noted that this verge was very dominated by the 'rank' False Oat-grass *Arrhenatherum elatius*, possibly indicating high nutrient levels in the soil. It is hoped that continued monitoring of the verges into the future will help to provide an explanation for the apparent loss of floral diversity at this verge.

The majority of the study verges were sown with a 'wild flower meadow' seed mixture at the time of their creation and as such cannot be considered representative of the local area's ecology. However, during the repeat assessment in 2016 a number of orchids previously absent from the verges were identified, including Common Spotted Orchid *Dactylorhiza fuchsii*, Bee Orchid *Ophrys apifera* (see Plate 7, centre pages) and Common Twayblade *Neottia ovata*. Studies have shown that roadsides can function as dispersal corridors for grassland plants (Tikka *et al*., 2001) and these orchids are known to occur locally, although scarce, indicating that they may have seeded naturally onto the verges from local sources.

All of this suggests that hay-meadow-style management could be an effective tool in creating and maintaining species-rich grassland habitats along roadside verges, which can provide habitats for locally scarce grassland plants and promote the ecological value of verges as wildlife corridors, in a manner that is compliant with highway management requirements.

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The Mollusca of some ancient semi-natural woodlands in coastal N.E. Yorkshire

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Introduction

The terrestrial molluscs of a series of ancient semi-natural and secondary woodlands in north-east Yorkshire (VC62) have been investigated previously (Wardhaugh, 1996, 1997a). Those woodlands considered to be ancient semi-natural (i.e. in continuous existence since at least 1600 AD, although probably for much longer) were found to be significantly more species-rich and to have certain mollusc species associated with them when compared with the secondary woods (i.e. tree plantations thought to have been established on previously cleared land, typically in the 18th and 19th centuries). For the original study nine ancient semi-natural woodlands were surveyed. All of these have been revisited during the intervening time and a further twelve have been investigated, the data thus generated forming the subject matter of this report. A recent article described the molluscan fauna of 14 woodlands in the northern part of VC62, thirteen of which are deemed to be secondary (Wardhaugh, 2016). This provides data with which comparison can be made but the distinction between ancient semi-natural and secondary woodlands is not a simple one (Wardhaugh, 2016). Previous articles about the molluscan fauna of individual woods visited as part of the current study include the following: Roxby and Easington Woods (Wardhaugh, 1986), Wilton Wood (Wardhaugh, 1997b), Beast Cliff (Norris, 2002) and Airy Holme Wood (Wardhaugh, 2005). The latter two make comparison between contemporary and historic records, that for Airy Holme Wood with an especially early and interesting account by Watson (1854).

Methods

Basic details about the 21 woodlands investigated are provided in Table 1. All are considered to be ancient semi-natural (Carter, 1987a, 1987b; Cooke, 1987), this conclusion being based

largely on cartographic evidence. Information about the predominant tree and herb layer species can be found in Wardhaugh (2015). Recording of molluscs was carried out by a combination of searching on site and hand sorting of leaf litter samples. Each site was visited several times and at different times of year. Where very common species had not been recorded at a site, the woodland in question was revisited with the particular aim of locating these. Each woodland was surveyed in that all potential habitat types were searched. Thus coverage was as complete as practicable.

Results

The total number of mollusc taxa found in each woodland is indicated in Table 1.

Table 1. The Woodlands investigated

Site Name	NGR	Approximate area (ha)	Approximate altitude (m)	Total no. of mollusc taxa recorded
Airy Holme Wood	NZ5711	7.5	130-180	48
Avens and Cow Close Woods	NZ7013	10	120-150	40
Bassleton Wood	NZ4415	5	8-15	30
Beast Cliff	TA0099	25	50-130	42
Castle Bank Wood	NZ5819	11	90-140	33
Clarkson's Wood	NZ7017	50	30-100	41
Cliff Ridge Wood	NZ5711	5	140-200	26
Dunsdale Wood	NZ6018	8.5	90-100	33
Easington Wood	NZ7517	60	30-100	30
Hayburn Wyke	TA0096	25	10-100	43
Mill Bank Wood	NZ5909	12	150-170	48
Mulgrave Woods	NZ8411	200	10-130	44
Newton Wood	NZ5712	22	130-210	34
Oakrigg Wood	NZ7816	50	20-70	36
Overdale Wood	NZ8514	13	50-90	34
Rifts Wood	NZ6620	6.5	10-50	39
Rosecroft Wood	NZ7117	15	70-100	32
Roxby Wood	NZ7516	78	20-100	39
Saltburn Gill	NZ6720	11.5	10-50	41
Whitecliff Wood	NZ7118	12	20-70	35
Wilton Wood	NZ5919	42	60-110	40

Full species lists for all of the woods are provided as an Appendix, available on the YNU website at http://www.ynu.org.uk/naturalist. This consists of 778 records made by the author together with an additional ten from other sources, as acknowledged, the latter being included in order to make the site lists as comprehensive as possible. All records date from 1985 to 2016 inclusive, although the large majority are from 2000 and after. The following points about taxonomic status should be noted. The Large Black Slug *Arion ater*, the Large Red Slug *A. rufus*

and apparent hybrids have been recorded as *Arion ater* aggregate. The Silver False-keeled Slug *A. silvaticus* was at one time considered to be a separate species from the Spotted False-keeled Slug *A. circumscriptus* but recently it has been reduced to sub-specific status (Geenan *et al.*, 2006; Rowson *et al.*, 2014a); they are listed as subspecies in the Appendix and counted as separate taxa in the following analysis. Similarly, doubt has been cast upon the specific status of the Rusty False-keeled Slug *A. fasciatus* (Jordaens *et al.*, 2001) but recent DNA studies by Rowson *et al.* (2014b) indicate that it is distinct from *A. circumscriptus* (and also that *A. silvaticus* is conspecific with *A. circumscriptus*, and that these could be regarded as different forms).

Discussion

Considerable effort has been made to produce comprehensive species lists for all of the sites; a complete species list for a woodland is probably unattainable (and in a sense unknowable) for a number of reasons. Several of the species involved are minute (2mm or less in their greatest dimension), some appear to vary considerably in population density on a seemingly random basis, some are present as quite localized populations within the woodlands, e.g. the Three-toothed Moss Snail *Azeca goodalli* (Paul, 1974; Topley *et al.*, 2013), and even some large species can be very elusive e.g. over a hundred Ash-black Slugs *Limax cinereoniger* were seen ascending tree trunks in Mulgrave Woods on 2 June 1999 but during many other visits this animal has not been seen at all. Further, the molluscan fauna of woodlands is not static. Some invasive slug species are notorious for their ability to spread rapidly, just how being something of a mystery. The Worm Slug *Boettgerilla pallens* has spread rapidly since it was first recorded in Britain in 1972 (Colville *et al.*, 1974) and has been found in seven of the woodlands in this survey. The Green Cellar Slug *Limacus maculatus* has been located at just one of the sites so far (Bassleton Wood, first noted on 12 August 2015); it seems to be the next likely rapid colonist as it spreads out from gardens and farmland into more natural habitats (Wardhaugh, 2016). The Glossy Glass Snail *Oxychilus navarricus helveticus* seems to be a recent colonist of Airy Holme Wood, first seen here on 29 August 2012 but never recorded previously in spite of much survey work, including two visits by the Yorkshire Conchological Society (Wardhaugh, 2005). By 2016 it was a common snail in the wood, found at rest on tree trunks and beneath coarse woody debris. Conversely, species may be lost from woodlands (or possibly lost); the Plated Snail *Spermodea lamellata* has not been found in Airy Holme Wood since the mid-19th century (Watson, 1854).

Casual inspection of the data suggests that these ancient semi-natural woods are more species-rich than the secondary woods forming the subject of another recent study in the same region (Wardhaugh, 2016). See last column of Appendix, where data from that study are summarized. Sixty taxa were recorded in the ancient semi-natural woods but only 41 in the secondary woods. The difference results from nineteen taxa being found only in the ancient semi-natural woods, no taxa being found only in the secondary woods. However, the situation is not simple, one confounding variable being woodland size. The mean area of the 21 ancient semi-natural woods is 31.9ha (range 5 to 200ha; median 13ha). In Wardhaugh (2016), 13 of the 14 woods discussed are considered to be secondary, their mean area being 6.6ha (range 1 to 26ha; median 5ha), the difference between the two woodland types being statistically significant (Mann-Whitney U-test, $Z = 3.502$, $P = 0.0004$). Larger woodlands may contain more terrestrial mollusc species, there being some evidence to support this (Wardhaugh, 1996).

Nonetheless, some comparison of species-richness can be made by considering only those woodlands from the two groups which fall into the same range of area. Thus for woodlands within the range 5 to 26ha, the ancient semi-natural woodlands are significantly more species-rich (Table 2). Data are too few for the converse analysis to be reliable, i.e. comparing mean woodland areas of those woods for which species totals overlap, there being in fact very little such overlap.

Table 2. Ancient semi-natural and secondary woods of areas 5 to 26ha compared.

	Ancient Woods (n = 15)	Secondary Woods (n = 7)
Mean number of mollusc taxa [range]	37.2 [26-48]	24.7 [17-34]
Mean area (ha) [range]	12.6 [5-25]	10.1 [5-26]

For two-tailed t-tests:
difference in mean number of mollusc taxa, $t = 4.19$, d.f. = 20, $P = 0.00045$
difference in mean woodland area, $t = 0.79$, d.f. = 20, $P = 0.439$

If, as they develop, secondary woods are colonized at random by mollusc species then one would expect no difference in frequency of occurrence of any species between the two woodland types. This is not the case, some of the possible reasons being described in Wardhaugh (2016). Of the 60 taxa recorded, 17 show a distinct bias towards occurrence in the ancient semi-natural woods (Table 3). Of these, six are well known to be associated with ancient semi-natural woodland, seemingly being confined to this habitat-type in the British Isles to a greater or lesser degree, depending to some extent upon geographical location (Kerney & Stubbs, 1980; Chator, 1998; Kerney, 1999; Wardhaugh, 2000). The Plated Snail seems to be particularly associated with ancient semi-natural woodland in the British Isles (Wardhaugh, 2011). The occasional presence of the Ash-black Slug (three sites) and the English Chrysalis Snail *Leiostyla anglica* (two sites) in the secondary woods is discussed in Wardhaugh (2016) and may perhaps result from their occurrence in (or spread from) pockets of older or less disturbed habitat within these. The general distribution of the Ash-black Slug in the Cleveland area (northern VC62) has been described previously (Wardhaugh, 2014).

An interesting aspect of the current comparison is that eleven other species were found exclusively, or nearly so, in the ancient semi-natural woodlands at sufficient frequency to suggest a genuine bias (Table 3). It should be stressed that for the most part they are not restricted to woodland habitats either locally or nationally and can occur in suitable, more open areas (Kerney, 1999). Within this group the Large Amber Snail *Succinea putris* and *Euconulus alderi* occur in more moist habitats generally, as do the Striated Whorl Snail *Vertigo substriata* and the English Chrysalis Snail (and also the Marsh Slug *Deroceras laeve*, found in 18 of the 21 ancient semi-natural woodlands but only 5 of the 13 secondary woods). Of the remaining species in this group the Copse Snail *Arianta arbustorum* occurs in a variety of habitats but Kerney (1999) makes the interesting comment that "The few Irish records are mostly from old, native woodland". Comments on the Silky Snail *Ashfordia granulata* by Kerney (1999) are particularly interesting, "a snail of damp herbage. It is rare in woods, preferring

open, unshaded places". Thus its occurrence in the ancient semi-natural woodlands of north-east Yorkshire may be atypical in a national context. Of the two door snails (Clausiliidae) in this list, Lloyd-Evans (1981) states that the Plaited Door Snail *Cochlodina laminata* prefers old woodland on base-rich soils in Yorkshire. It can, however, occur elsewhere, such as on calcareous dry-stone walls. Similarly the Two-toothed Door Snail *Clausilia bidentata* showed a marked bias toward the ancient semi-natural woodlands but it can also occur on walls and on coastal dunes and grassland (e.g. at Cattersty in north-east Yorkshire, NZ7020).

Table 3. Mollusc occurrence in ancient and secondary woods.

Species	Vernacular Name (if any)	Number of ancient woods in which recorded (n = 21)	Number of secondary woods in which recorded (n = 13)
Ancient woodland indicators			
Acicula fusca	Point Shell	4	0
Leiostyla anglica	English Chrysalis Snail	14	2
Limax cinereoniger	Ash-black Slug	10	3
Spermodea lamellata	Plated Snail	15	0
Vertigo substriata	Striated Whorl Snail	6	0
Zenobiella subrufescens	Brown Snail	12	0
Others			
Arianta arbustorum	Copse Snail	19	1
Arion circumscriptus silvaticus	Silver False-keeled Slug	10	0
Ashfordia granulata	Silky Snail	10	0
Azeca goodalli	Three-toothed Moss Snail	5	0
Cepaea hortensis	White-lipped Banded Snail	16	0
Clausilia bidentata	Two-toothed Door Snail	18	0
Cochlodina laminata	Plaited Door Snail	14	0
Columella aspera		11	0
Euconulus alderi		6	0
Merdigera obscura	Lesser Bulin Snail	6	1
Succinea putris	Large Amber Snail	6	0

The mean number of taxa recorded in the 21 woods is 37.5 (range 26 to 48), which makes some of them the most species-rich ancient semi-natural woodlands known in Britain (Wardhaugh, 1996 and references therein; also Cameron, 2006). The likely reasons for this relate to their underlying geology, their microclimate and their lack of disturbance. Many of these woodlands are situated in steep-sided valleys carved out by becks which cut through boulder clay overlying Jurassic strata including sandstones, ironstones, shales and marls (Kent & Gaunt, 1980; Atherden & Simmons, 1996). The soils resulting from this geological mix are variable in pH, resulting in a rich and diverse flora (Lawrence, 1990, 1994). Sheltered from high winds at any season, notably from winter storms, and shady in summer, the gills are protected

from extremes of temperature and have their own microclimate. In spite of occurring in a region of relatively low annual rainfall they are often damp underfoot, still and humid. They appear to be the fragmented descendants of an original forest cover that have survived often in steep-sided valleys too inaccessible either for agricultural use or for timber to be extracted to the point where woodland cover was lost. As such they are of high biodiversity not only for terrestrial molluscs but for a wide range of taxa (Wardhaugh, 2015).

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Erratum

In Wardhaugh (2016) *Woodlands of the Ormesby to Wilton areas, N.E. Yorkshire: some observations on their terrestrial molliuscs and flora* (*The Naturalist* 141 (1092): 127-134) the 2nd paragraph of the methods section was inadvertently omitted and the editors sincerely apologise for this. The methods used were the same as described in the paper above.

Yorkshire Ichneumons: Part 6

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Introduction

Yorkshire statuses are taken from the chart shown on the YNU website.

† = new county record
* = new vice-county record

Subfamily **PIMPLINAE**
Additions to Ely (2013a):
Polysphincta rufipes Gravenhorst, 1829. Scarce in Yorkshire.
*VC65: Nosterfield NR 11.8.2016 C.H.Fletcher.
Acrodactyla similis Horstmann, 2011. Rare in Yorkshire.
Reported from VC62 in the original description (Horstmann 2011, p7).
*VC63: Old Spring Wood 30.8.2000 W.A.Ely.
Zatypota discolor (Holmgren, 1860). Rare in Yorkshire.
*VC63: Belton Moor, Hatfield Moor 7.2015 unknown.

Subfamily **TRYPHONINAE**
Additions to Ely (2015a):
Tribe ***Phytodietini***
Phytodietus (Phytodietus) geniculatus (Thomson, 1877). Rare in Yorkshire.
*VC63: Blackhills, Keighley 26.9.1919 G.H.Rhodes.
Netelia (Netelia) opacula (Thomson, 1888). Rare in Yorkshire.
*VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 8-15.7.2003 S.E.M.Fraser.

Tribe ***Oedomopsini***
Thymaris niger (Taschenberg, 1865). New to Yorkshire.
†VC63: Brecks 24.8.2016 M.A.Smethurst.

Tribe ***Tryphonini***
Tryphon (Symboethus) fulviventris Holmgren, 1857. New to Yorkshire.
†VC64: Shipley Glen rough side 12.6.1948 J.Wood.

Tribe ***Exenterini***
Kristotomus pumilio Holmgren, 1855. Rare in Yorkshire.
*VC64: Upper Dunsforth Carrs YWT NR 15.6.2015 R.Crossley.
Kristotomus ridibundus (Gravenhorst, 1829). Rare in Yorkshire.
*VC61: Wheldrake 14.10.2015 J.Small.

Subfamily **ADELOGNATHINAE**
Additions to Ely (2015b):
Adelognathus pallipes (Gravenhorst, 1829). Rare in Yorkshire.
*VC61: Rush Wood, Naburn 4-11.9.2003 S.E.M.Fraser.
*VC64: Hollins Hill, Baildon 24-30.6.2015 H.N.Whiteley.

Subfamily **XORIDINAE**
Addition to Ely (2015b):
Odontocolon dentipes (Gmelin, 1790). Rare in Yorkshire.
*VC61: Wheldrake Woods 25.7.2015 J.Small.
*VC63: Yorkshire Wildlife Park 22.8.2016 D.Whiteley.

Subfamily **CRYPTINAE**
Tribe ***Gelini***
Additions to Ely (2015b and 2016):
Subtribe ***Acrolytina***
Encrateola glabra Horstmann, 1998. Rare in Yorkshire.
*VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 10-17.6.2003 S.E.M.Fraser.
Lysibia nana (Gravenhorst, 1829). Uncommon in Yorkshire.
*VC62: Thornton Dale 25-29.4.1946 W.D.Hincks.

Subtribe ***Hemitelina***
Aclastus pilosus Horstmann, 1980. Scarce in Yorkshire.
*VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 8-15.7.2003 S.E.M.Fraser.

Subtribe ***Gelina***
Gelis rugifer (Thomson, 1884). New to Yorkshire.
†VC62: Fen Bog YWT NR 15.7.2015 R.Crossley.

Subtribe ***Mastrina***
Isadelphus gallicola (Bridgman, 1880). Rare in Yorkshire.
*VC61: Whins Lane, Rise 25.7.2011 W.A.Ely.

Subtribe ***Endaseina***
Endasys brunnulus Sawoniewicz & Luhman, 1992. New to Yorkshire.
†VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 8-15.7.2003 S.E.M.Fraser.
Glyphicnemis vagabunda (Gravenhorst, 1829). Rare in Yorkshire.
*VC63: Wood Hall, Leeds 14.7.1944 W.D.Hincks.

Subtribe ***Phygadeuontina***
Orthizema triannulatum (Thomson, 1884). Rare in Yorkshire.
*VC61: Rush Wood, Naburn 4-11.9.2003 S.E.M.Fraser.
Uchidella brevicauda Horstmann, 1993. Rare in Yorkshire.
*VC61: Grimston Wood, Clock Farm, Dunnington Common 4-11.9.2003 S.E.M.Fraser.
Stibeutes heinemanni Förster, 1850. Scarce in Yorkshire.
*VC64: Upper Dunsforth Carrs YWT NR 15.6.2015 R.Crossley.

Subtribe ***Bathytrichina***
Bathythrix thomsoni (Kerrich, 1942). Scarce in Yorkshire.
*VC63: St Ives, Keighley 11.9.1943 J.Wood.

Subtribe ***Stilpnina***
Stilpnus (Stilpnus) blandus Gravenhorst, 1829. Rare in Yorkshire.
*VC63: Royd Lane, Keighley 30.6.1944 J.Wood.
Mesoleptus congener (Förster, 1876). Scarce in Yorkshire.
*VC61: Wheldrake Ings YWT NR 26.10.2016 J.Small.

Tribe ***Hemigastrini***

Demopheles corruptor (Taschenberg, 1865). Rare in Yorkshire.
Reported from VC63 in Ely (2014b) p42.

*VC61: Hacking Wood, Escrick Park 4-11.9.2003 S.E.M.Fraser.
*VC64: Malham Tarn Fen 5.2013 P.W.H.Flint,S.Flint.

Aptesis cretata (Gravenhorst, 1829). Rare in Yorkshire.
Unconfirmed record from VC65 in Roebuck (1907) p214 and Morley (1907) p44.

*VC61: Rush Wood, Naburn 4-11.9.2003 S.E.M.Fraser (det. G.R.Broad).
†VC64: Copmanthorpe Wood 8-15.7.2003 S.E.M.Fraser.

Aptesis flagitator (Rossius, 1794).
Unconfirmed record from VC63 in Hincks (1943a) p58.

Aptesis improba (Gravenhorst, 1829). Rare in Yorkshire.

†VC63: Holmehouse Wood 6.9.1942 J.Wood.

Aptesis jejunator (Gravenhorst, 1807).
Unconfirmed record from VC61 in Fordham (1919) p70, Hincks & Dibb (1940) p174 and Hincks (1953) p135, from VC62 in Walsh & Rimington (1956) p275 and from VC63 in Butterfield (1909) p197.

Aptesis leucosticta (Gravenhorst, 1829) nom. dub.
Unconfirmed record from VC63 in Hincks (1943a) p58.

Aptesis nigrocincta (Gravenhorst, 1815). Scarce in Yorkshire.
Unconfirmed record from VC61 in Fordham (1919) p70.

*VC62: Mulgrave Wood 23.11.1936 H.Britten.
*VC63: Holmehouse Wood 28 + 30 + 31.7 + 1 + 9 + 30.8.1941 + 23.8 + 23 + 27.10.1942 J.Wood.
†VC64: Grassington 7.1919 R.Butterfield.
*VC65: Barth Bridge, Sedburgh 29.9.2012 W.A.Ely.

Parmortha parvula (Gravenhorst, 1829).
Unconfirmed unlocalised record in Stephens (1835) p279 and unconfirmed reports from VC64 in Bairstow, Roebuck & Wilson (1882) p104, Wilson (1883) p109, Roebuck (1907) p214 and Morley (1907) p256.

Cubocephalus brevicornis (Taschenberg, 1865).
Unconfirmed records from VC63 in Hincks (1943) p58 and from VC64 in Bairstow, Roebuck & Wilson (1882) p104, Wilson (1883) p109, Roebuck (1907) p214 and Morley (1907) p23.

Cubocephalus distinctor (Thunberg, 1824).
Unconfirmed record from VC64 in Hincks (1943a) p58.

Cubocephalus sperator (Müller, 1776).
Unconfirmed unlocalised record in Stephens (1835) p294 and from VC65 in Roebuck (1907) p214 and Morley (1907) p48.

Oresbius castaneus Marshall, 1867.
Unconfirmed records from VC64 in Hincks (1944) p37; (1958) p17.

Polytribax arrogans (Gravenhorst, 1829). Scarce in Yorkshire.
Reported from VC61 (as *P. perspicillator)* by Fordham (1919) p70 and from VC64 in Ely (2012a) p224.

*VC62: Cleveland 1931 MLT.
*VC63: Keighley 26.7.1943 J.Wood.

Polytribax perspicillator (Gravenhorst, 1807). Rare in Yorkshire.
Unconfirmed record from VC61 in Hincks & Dibb (1940) p174. Reported from VC64 in Hincks (1943b) p91; (1944) p37 and Key (1987b) p384.

*VC62: Black Hills, Northallerton 29.6.2011 W.A.Ely.
*VC63: Holmehouse Wood 3.7.1943 J.Wood.
*VC65: Ravensworth 5.7.1923 W.J.Fordham.

Plectocryptus digitatus (Gmelin, 1790). New to Yorkshire.
†VC65: Hag Wood, Richmond 20.6.2014 W.A.Ely.

Schenkia graminicola (Gravenhorst, 1829). Rare in Yorkshire.
Unconfirmed unlocalised record in Stephens (1835) p283 and unconfirmed records from VC62 in Roebuck (1877) p38; (1907) p214 and Morley (1907) p34.
*VC62: Deighton 30.9.2013 W.A.Ely.
†VC63: Don Canal, Holmes 13.8.2000 W.A.Ely.

Pleolophus basizonus (Gravenhorst, 1829).
Unconfirmed record from VC64 in Hincks (1943) p58.

Pleolophus sericans (Gravenhorst, 1829).
Unconfirmed record from VC63 in Hincks (1943) p58 and from VC64 in Hincks (1943) p59.

Listrocryptus spatulatus Brauns, 1905. Rare in Yorkshire.
Reported from VC61 in Hincks (1953) p135.

Javra tricincta (Gravenhorst, 1829).
Unconfirmed record from VC64 in Hincks (1942) p172; (1943) p58.

Tribe ***Cryptini***

Agrothereutes abbreviatus (Fabricius, 1794). Rare in Yorkshire.
Unconfirmed records from VC62 in Walsh (1922) p72 and Walsh & Rimington (1956) p276 and from VC65 in Roebuck (1907) p214 and Morley (1907) p34. Reported from VC64 in Hincks (1945) p37.
*VC61: Allerthorpe Common 5.8.1989 W.A.Ely.
*VC63: Treeton Wood 9.6.1977 J.E.Addey,P.G.Stenton.

Agrothereutes fumipennis (Gravenhorst, 1829). New to Yorkshire.
†VC61: Spurn Point YWT NR lagoons 4.9.2013 P.Kendall .

Agrothereutes leucorhaeus (Donovan, 1810). Rare in Yorkshire.
Reported from VC63 in Schwarz & Shaw (1998) p109 and Ely (2014b) p42.

Agrothereutes mandator (Linnaeus, 1758). Rare in Yorkshire.
Unconfirmed record from VC64 in Wilson (1884) p117 and Roebuck (1907) p214.
†VC63: Castleford ex *Trichiosoma lucorum* 6.4.1956 RFD (det. W.D.Hincks) .

Agrothereutes saturniae (Boie, 1855). New to Yorkshire.
†VC62: RAF Fylingdales cocoon ex *Saturnia pavonia* 1996 (em 14.7.1997) G.J.King (det. M.R.Shaw).

Gambrus bipunctatus (Tschek, 1872). Rare in Yorkshire.
Reported from VC62 in Ely (2013d) p237; (2014a) p229 and from VC64 in Ely (2014a) p229.
*VC63: St Ives 28.6.1947 J.Wood.

Gambrus carnifex (Gravenhorst, 1829). Scarce in Yorkshire.
Reported from VC64 in Hincks (1945) p37; (1947) p38.
*VC63: Blacktoft sands 6.1977 + 6 + 9.1979 A.Grieve (det. M.G.Fitton).

Gambrus ornatus (Gravenhorst, 1829). Scarce in Yorkshire.
Reported from VC63 in Schwarz & Shaw (1998) p111.
*VC61: Long Bank Dyke, Kilnsea 22.7.1948 W.D.Hincks (det. J.F.Perkins).

Gambrus tricolor (Gravenhorst, 1829). Rare in Yorkshire.
Unconfirmed record from VC64 in Wilson (1884) p117 and Roebuck (1907) p214.
*VC63: Turnshaw Common, Ulley 22.9.2014 W.A.Ely.
†VC64: Bilton Beck Wood 1.7.1989 W.A.Ely.

*VC65: Maize Beck, Upper Teesdale 20.9.2016 D.Whiteley.

Thrybius praedator (Rossi, 1792). Rare in Yorkshire.

Reported from VC63 in Ely (2014b) p42.

Aritranis director (Thunberg, 1824). Uncommon in Yorkshire.

Reported from VC61 in Hincks (1943c) p123; (1946b) p166; (1953b) p276, from VC62 in Hincks (1943) p59 and from VC65 in Ely (2013c) p 231.

*VC63: Holmehouse Wood 25.7.1942 J.Wood.

*VC64: Halton Moor, Wyke Beck 4.6.2012 W.A.Ely.

Hoplocryptus confector (Gravenhorst, 1829). Rare in Yorkshire.

Unconfirmed record from VC64 in Wilson (1883) p109, Bridgman & Fitch (1883) p33,36, Roebuck (1907) p214 and Morley (1907) p291.

*VC61: Sandhill Lock, Pocklington Canal, Bielby 13.9.2015 J.Small.

*VC63: Fence, Aston 20 + 24.6.2015 R. Holden.

†VC65: High Batts NR 21.7.2014 W.A.Ely.

Idiolispa analis (Gravenhorst, 1807). Rare in Yorkshire.

Unconfirmed record from VC64 in Bairstow, Roebuck & Wilson (1882) p104 and Roebuck (1907) p214. Reported from VC63 in Ely (2014b) p42.

*VC61: Skipwith Common NNR 2.5.2011 R.Crossley.

Idiolispa obfuscator (Villers, 1789).

Unconfirmed record from VC64 in Morley (1907) p297.

Trychosis insularis Rossem, 1990. New to Yorkshire.

*VC61: Dimlington cliffs 14.8.2013 W.A.Ely (tM.Schwarz).

†VC63: Scholes bellpits 23.6.1991 J.A.Newbould,P.J.Bowler.

Trychosis legator (Thunberg, 1824). Frequent in Yorkshire.

Reported from VC61 in Hincks (1951a) p28; (1953b) p135.

*VC62: Long Nab, Scarborough 2.6.2011 D.Whiteley.

*VC63: Blackbrook Wood 15.8.1973 W.Davison.

*VC64: Drax Hales 26.7.1987 W.A.Ely.

*VC65: Hutton Conyers 12.6.2011 C.H.Fletcher.

Trychosis tristator (Tschek, 1870). Scarce in Yorkshire.

Reported from VC62 in Schwarz & Shaw (1998) p115.

*VC61: Skipwith Common NNR 11.7.2011 R.Crossley,

*VC63: Carr Brook 1.8.1992 R.Shaw.

*VC64: Elleker Field, East Keswick 24.7.2014 P.Holmes.

Ischnus inquisitorius (Müller, 1776). Scarce in Yorkshire.

Reported from VC61 in Hincks (1953) p135 and from VC64 in Hincks & Dibb (1940) p175 and Hincks (1943) p59.

*VC63: Little Stones 27.4.2005 W.A.Ely.

Ischnus migrator (Fabricius, 1775). Rare in Yorkshire.

Unconfirmed record from VC63 in Bairstow (1878) p69, Roebuck, Bairstow & Wilson (1882) p104 and Roebuck (1907) p214. Reported from VC61 in Hincks (1953) p135 and from VC62 in Hincks (1956) p149; (1957) p21 and Key (1987a) p152.

Hidryta sordida (Tschek, 1871). New to Yorkshire.

†VC62: Fen Bog YWT NR 6.6.2014 R.Crossley.

Buathra laborator (Thunberg, 1824). Scarce in Yorkshire.

Reported from VC61 in Hincks (1946b) p160; (1947) p38 and from VC64 in Hincks (1943b) p91; (1944) p37 and Key (1987b) p384.

*VC63: M62 Trading Estate, Goole 19.5.1984 P.Kendall.

Buathra tarsoleuca (Schrank, 1781). Rare in Yorkshire.
Reported from VC61 in Hincks (1953) p135.
Cryptus armator Fabricius, 1804. Rare in Yorkshire.

*VC61: Tophill Low NR 7.7.2012 W.A.Ely.
*VC62: Duncombe Park 18.6.1983 P.Skidmore.
†VC63: Wharncliffe Wood 3.9.1979 A.Brackenbury.
*VC64: Hollins Hill, Baildon summer 2013 H.N.Whiteley.
*VC65: Hardings 12.7.1983 W.A.Ely.

Cryptus dianae (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC63 in Skidmore, Limbert & Eversham (1987) p127, Skidmore (2006) p148 and Ely (2014b) p38.

*VC61: Allerthorpe 25.9.1920 + Common 27.8.1927 W.J.Fordham.
*VC62: Ravenscar 25.8.1928 TS (det. J.F.Perkins).

Cryptus inculcator (Linnaeus, 1758).
Unconfirmed record from VC64 in Wilson (1884) p117 and Roebuck (1907) p214.
Cryptus macellus Tschek, 1871. Rare in Yorkshire.
Reported from VC61 in Hincks (1951) p28; (1953) p135.
Cryptus minator Gravenhorst, 1829.
Unconfirmed record from VC64 in Hincks (1943) p59.
Cryptus moschator (Fabricius, 1787). Rare in Yorkshire.

†VC61: Barmby Moor 27.5.1934 W.J.Fordham (det. J.F.Perkins).
*VC63: Royds Lane, Keighley 26.7 + 5.9.1943 J.Wood.

Cryptus titubator (Thunberg, 1824). Scarce in Yorkshire.
Unconfirmed record from VC64 in Hincks (1941) p246. Reported from VC61 in Hincks (1953) p135.

*VC63: Holmehouse Wood 16.8.1942 J.Wood.
*VC64: Shipley Glen 14.6.1930 J.Wood.

Cryptus viduatorius Fabricius, 1804. Rare in Yorkshire.
Unconfirmed record from VC62 in Roebuck (1907) p214 and Morley (1907) p308. Reported from VC61 in Hincks (1953) p135.

*VC63: Wincobank Wood 11.7.1991 A.Brackenbury.

Listrognathus obnoxius (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC63 in Schwarz & Shaw (1998) p123.
Nematopodius debilis (Ratzeburg, 1852). Rare in Yorkshire.
Reported from VC63 in Coldwell (1999) p61.

*VC64: Sharp Hill, Drax 21.7.1987 W.A.Ely.

Sphecophaga vesparum (Curtis, 1828). Rare in Yorkshire.
Unconfirmed record from VC63 in Smith (1858) p218, Roebuck (1877) p38; (1907) p215 and Morley (1900) p123; (1911) p135.

*VC64: Saxton 1918 C.D.Ashe.

Subfamily **STILBOPINAE**

Panteles schuetzeanus (Roman, 1925). Rare in Yorkshire.

†VC64: Malham Tarn 12.9.1957 W.D.Hincks.

Stilbops limneriaeformis (Schmiedeknecht, 1888). Rare in Yorkshire.
Reported from VC64 in Ely (2013b) p227.

Stilbops vetula (Gravenhorst, 1829). Frequent in Yorkshire.
Unconfirmed record from VC62 in Roebuck (1877) p39; (1907) p215 and Morley (1908) p174. Reported from VC63 in Hammett & Hammett (1985) p11 and Coldwell (1999) p61 and from VC64 in Hincks & Dibb (1940) p176 and Ely (2012b) p227.

*VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 13-20.8.2003 S.E.M.Fraser.
*VC62: Malton Road, York 7 + 13 + 14 + 20.5.1944 J.H.Elliott.

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Excursion Circulars 2017

Circular No. 900

Divisional Secretary VC64: Terry Whitaker, 4 Crowtrees, Low Bentham, Lancaster, LA2 7EE, Tel: 01524 262269 Email: t.whitaker1@btinternet.com

The **VC64** meeting will be to **Beecroft Plantation & Thackray Beck, near Timble (SE1753) on Saturday 20 May 2017.**

Meet at 10:30 at the Car Park (SE186538) at Swinsty Moor where there are also toilets.
The reporting meeting will take place from 16:00 at the Robinson Library & Village Hall, Timble [SE179529]. Tea & coffee and biscuits will be provided.

The Lepidoptera group is invited to trap in Beecroft Plantation on 19 May (Friday night). Meet at the Robinson Library, Timble at 19:30.

Maps: OS Explorer 297 Lower Wharfedale & Washburn Valley 1:25,000 Map

The Area: The Washburn Valley and the river Washburn lie on the edge of Nidderdale and Wharfedale at the edges of The Yorkshire Dales. The Gritstone Valley Landscape Character Type encompasses the valleys of the River Nidd, and also the River Washburn, which extends north-westwards into the Dales from the eastern side of Otley. The valley of the Washburn is a relatively narrow V-shaped valley. Landform rises between 50m to 100m asl in the valley bottoms to 80m to 400m asl on the valley sides. Where the valley has not been flooded to make the reservoirs, the sides are 'V' shaped. There are extensive views of the pastoral and wooded scenery from nearby low (200 <300m) hills.

Lindley Wood, Swinsty, Fewston and Thruscross Reservoirs dominate long sections of the valley with dams across the narrow, steep-sided sections. Numerous small becks descend from the valley sides to feed the reservoirs and main rivers. Springs and wells are dotted throughout the valleys. Land-cover is dominated by improved and semi-improved grassland, which is intensively managed for livestock and fields are generally small. The River Washburn originates high in the extensive upland blanket bogs and the peat and heather moorland of Greenhow Hill, and flows south from Washburn Head to meet the River Wharfe downstream of Otley. The lush green valley is mainly used for livestock farming and the patchwork of fields and stone walls is interspersed by large areas of conifer plantations and ancient woodlands, mainly around the reservoirs. There are also wide areas of marshy wetland and moorland with abundant birdlife. The reservoirs and woodlands of the Washburn Valley hold large numbers of wading birds and wildfowl and the skies are filled with a variety of species including Buzzard, Red Kite and occasional Hen Harrier. Grey Heron and Kingfisher are regular on the streams, rivers and reservoirs.

The solid geology of the area is that of the Upper Carboniferous with mainly grits, sandstones and shales of the Namurian stratigraphy. This sandstone-dominated 'millstone grits' series is

regionally variable in bedding but thickens to the south to a maximum of over 5,000 feet of sedimentation.

The drainage of the Lower Washburn Valley has been described as slowly permeable and seasonally waterlogged. The bedrock is covered with fine loam over clay soils with some peat soils at higher elevations on the fringe of the moorland. The valley floor consists of sandstones and shales but much of the area is overlain with till and glacial drift with alluvial deposits in the valleys. To the south of the River Wharfe the gritstones start to dominate the landscape with the Rough Rock and Middle Grit dominating the north-facing escarpment. On the higher lands to the northeast of the Washburn there is a capping of the Grassington Grit Formation (Brimham Grits).

It was in 1870 that the Leeds Corporation commenced the construction of three immense reservoirs to dam the River Washburn to create the fresh water supply for the City of Leeds, 17 miles away. The lowest of these reservoirs was made at Lindley Wood. Within a month the ground was cleared and three long rows of brick huts were erected, also stables, a food shop and a shanty to sell beer, but neither church nor school for the people was considered necessary in those days. There are still the remains of ancient settlements to be seen and beneath Swinsty Reservoir lies the village of New Hall, which was flooded.

Wildlife is abundant in the area as the many diverse natural habitats support a wide range of small mammals, plants, insects and fish but it is poorly recorded. Roe Deer are common in the woodlands. The reservoirs and rivers in the valley offer superb fishing venues for the avid angler. Stocked Rainbow and Blue Trout, as well as large numbers of native Brown Trout, can be fished from the reservoirs along with several other wild fishes. During May to July the huge hatch of mayfly attract many anglers to the area. Although access to the water in the reservoir is restricted it is expected that the limnologists may find many interesting animals in the woodland ponds and in Thackray Beck [SE1754]. Especially to be looked for is the scarce Downy-emerald Dragonfly *Cordulia aenea* reported from the area.

Records of Lepidoptera are scarce, especially of micro-lepidoptera, but White-letter and Purple Hairstreak butterflies are reported in the area, as is the scarce day-flying moth (rapidly heading to RDB status) the Argent & Sable *Rheumaptera hastata* (this should not be confused with the Small Argent & Sable *Epirrhoe tristata* which is also present in heathy areas). We intend to make a special search hoping to establish that the moth is still present after over 25 years.

Previous YNU visits to the area

Excursion 50 (26.9.1885) Blubberhouses
Excursion 155 (30.6.1906) Harrogate/Fewston
Excursion 305 (10.7.1937) Blubberhouses

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YNU Naturalist (1906) 31: 271-275.
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<u>Circular No. 901</u>

Divisional Secretary VC65: Terry Whitaker, 4 Crowtrees, Low Bentham, Lancaster, LA2 7EE.
Tel: 01524 262269 Email: t.whitaker1@btinternet.com

The **VC65** meeting is to **Freeholders & St. John's Wood-Riddings Field, Aysgarth (SE014888)**, on **Saturday 10 June 2017.**

Meet at YDNP Centre car park at SE010887 at 10:30. The YDNP Car park is convenient but rather expensive for short stay. There may be cheaper options in the village.
Reporting Meeting at the Aysgarth Falls Hotel (SE011883) at 16:00.
The Lepidoptera group is invited to trap in Freeholders Wood on 9 June (Friday night). Meet YDNP Centre car park [SE010887 by 20:00]. No electricity supplies are available.

Maps: OS Explorer Map OL30 Yorkshire Dales North, 1:25,000.

The Area: The lower northern dales comprise open and exposed, broad, u-shaped valleys with moors and fells at higher elevations. Predominantly pastoral in character with distinctive field patterns and boundaries, those on higher ground resulting from the Enclosure Acts of the 18th century. There is a strong relationship between landscape character and the geology of the local Carboniferous rocks which are part of the limestones, sandstones. mudstones and shales of the Yoredale Group of the Brigantian, Alston Formation that were laid down on the sea floor over 300 million years ago. The varying durability of these rocks is the cause of the stepped cascades on the River Ure and its tributaries. The Gayle Limestone, of variable thickness (13-25m), outcrops at Aysgarth Middle Force and its tripartite nature can be seen. The upper bed is typified by large coral colonies.

The area supports a diverse pattern of land-cover including calcareous grassland, pasture, species-rich upland hay meadows, limestone scars, a few limestone pavements and pockets of broadleaf and coniferous woodland. Freeholders Wood, situated on the north bank of the River Ure at Aysgarth Falls, is of special interest as it is one of very few examples of Hazel *Corylus avellana* coppice in the Yorkshire Dales. The ground flora is very rich, typical of calcareous woodland, which is enhanced by the active coppice management reinstated in 1983. Its name relates to the historic freeholder rights to cut and collect underwood. The semi-natural ancient woodland comprises a mixture of mature and recently coppiced Hazel but there are also thickets of Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa* while standard trees include Ash *Fraxinus excelsior*, Rowan *Sorbus aucuparia*, Bird Cherry *Prunus padus* and Holly *Ilex aquifolium*. Wych Elm *Ulmus glabra* used to be frequent but older trees are continually killed by Dutch elm disease, and only large saplings survive to set seed.

The ground flora is diverse throughout with an abundance of spring flowering plants such as Primrose *Primula vulgaris*, Bluebell *Hyacinthoides non-scripta*, Dog's Mercury *Mercurialis perennis*, Wood Anemone *Anemone nemorosa*, Common, Early and Hairy Dog-violets *Viola riviniana, V. reichenbachiana* and *V. hirta.* The uncommon Herb Paris *Paris quadrifolia*, typical of ancient woodland, is also frequent. Those areas not recently coppiced tend to be dominated by one or two species such as Dog's Mercury and Wood Anemone. In contrast, recently coppiced plots, where light penetrates the canopy, support a greater variety of plants including

Heath Speedwell *Veronica officinalis*, Wood Avens *Geum urbanum*, Selfheal *Prunella vulgaris*, lady's-mantle, Wild Strawberry *Fragaria vesca* and Barren Strawberry *Potentilla sterilis*. The site is cut by a disused railway line which is somewhat overgrown.

Towards the southern edge of the site, below footpaths between the Aysgarth Falls, is a steep wooded slope with rock outcrops and a flat limestone platform adjacent to the river. This platform, which is widest at the eastern end of the wood, supports a number of plants typical of limestone grassland areas, including Glaucous Sedge *Carex flacca*, Wild Thyme *Thymus praecox*, Grass-of-parnassus *Parnassia palustris*, Blue Moor-grass *Sesleria albicans* and Bird's-eye Primrose *Primula farinosa* here in a small basic flush. This area also supports an interesting mix of sedges including Common Sedge *Carex nigra*, Long-stalked Yellow-sedge *C. lepidocarpa* and Carnation Sedge *C. panicea*, together with various rushes, Lesser Spearwort *Ranunculus flammula* and Square-stalked St John's-wort *Hypericum tetrapterum*.

The woodland falls steeply to the river where there are limestone outcrops; localised flush communities occur where springs emerge. Aysgarth Falls is a dramatic landmark at any time of year but especially in times of spate. It comprises a gorge with a series of stepped waterfalls consisting of horizontal layers of hard Yordale series limestone separated by thin bands of shale. The falls themselves are a nick point produced following the Ice Age when the large glacier which flowed eastwards down the valley, melted. The site is protected as part of the Aysgarth SSSI.

The River Ure is clean and rich in wildlife although subject to diffuse pollution by agriculture upstream and in Widdale. It is still home to the rare White-clawed Crayfish *Austropotamobius pallipes* and there is also a rich variety of insect life including mayflies and stoneflies. On a warm summer evening Brown Trout may be seen in the quieter sections of the river rising for flies. Of the many riverside birds the Dipper may be watched 'bobbing' at the water's edge or diving under the water for food. Pied and Grey Wagtails can also be seen here and very rarely the Yellow Wagtail. The woodlands are also rich in small birds; Nuthatch, Treecreeper, Goldcrest and Bullfinch breed here. At the Riddings (part of the River Ure Grasslands SSSI) are calcareous knolls set in a matrix of semi-improved neutral grassland adjacent to Freeholders Wood and Aysgarth Falls.

Within the calcareous grassland community of Red Fescue *Festuca rubra*, Meadow Fescue *F. pratensis*, Common Bent *Agrostis capillaris*, Quaking-grass *Briza media*, Downy Oatgrass *Avenula pubescens* and Crested Hair-grass *Koeleria macrantha*, Pignut *Conopodium majus* is abundant. The Burnt Orchid *Orchis ustulata* is the most notable forb but the occurrence of Green-winged Orchid *Orchis morio* is also of note. In North Yorkshire the Burnt Orchid is found at the northern edge of its range and it is restricted to only eight localities, at none of which is it very abundant. Other plants include Field Wood-rush *Luzula campestris*, Glaucous Sedge and Spring Sedge *C. caryophyllea*. Associated herbs include Salad Burnet *Sanguisorba minor*, Cowslip *Primula veris*, Common Rock-rose *Helianthemum nummularium*, Common Knapweed *Centaurea nigra*, Autumn Gentian *Gentianella amarella*, Hoary PLantain *Plantago media*, Fairy Flax *Linum catharticum* and Common Restharrow *Ononis repens*. There is also a scattering of coppiced Hazel.

This rich flora supports a correspondingly diverse invertebrate fauna which is poorly known. The Northern Brown Argus butterfly *Aricia artaxerxes* is common on the dense Rockrose areas found on the limestone knolls of Riddings Field and most of the more common Dales butterflies occur in the area. The moth fauna should be rich but is very under-recorded.

The declining native, Common or Hazel Dormouse *Muscardinus avellanarius*, was probably historically present in the wood but it became extinct in North Yorkshire by the 1960s. It was introduced to the wood in 2007 by the Yorkshire Dales National Park Authority (YDNPA) and the Peoples Trust for Endangered Species (PTES) and a number of nesting boxes were installed to support the population. To date it appears that the Dormice are breeding successfully and are expected to gradually spread from the introduction area. An account of the release project is given by White & Court (2012). Roe Deer present an ongoing management problem to protect young coppice growth.

Previous YNU visits to the area

YNU Excursion 85 (22.5.1893) Aysgarth
YNU Excursion 273 (23-25.5.1931) Leyburn/Aysgarth
YNU Excursion 475 (10-11.7.1971) Aysgarth/Bishopdale
YNU Excursion 544 (15.6.1985) Aysgarth

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The Naturalist (1893) 18: 222-232
YNU (1894) *Trans. Suppl.* 20
YNU (1931) Circular 361, *The Naturalist Suppl.*, 56.
The Naturalist (1931) 56, 267-281.
YNU (1971) Circular 664 Separate
The Naturalist (1971) 96: 140-145.
YNU (1985) *YNU Bull.*, Circular 741, 3: 31.

Circular No. 902

Divisional Secretary VC61: Sarah White, Yonder Cottage, Ashford Hill, Thatcham, Berkshire, RG19 8AX. Tel: 01635 268442 Email: sarahpriest656@btinternet.com

The **VC61** Meeting will be held at **Eastrington Ponds** on **Saturday 8 July 2017**

Maps: 1:50,000 Landranger Sheet: 105 York & Selby
1:25,000 Explorer Sheet: 291 Goole & Gilberdyke.

Meeting Place: Eastrington Ponds is situated on the west side of Eastrington village, three miles east of Howden, grid reference SE787298, postcode DN14 7PL. The reserve is signposted from the road, with a brown sign featuring a fish symbol, adjacent to the narrow railway bridge. There is a designated car park and we will meet there at 10.30am. There is a portaloo at the reserve, which we hope will be open for us.

Reporting Meeting: This will be at 4.30pm in Eastrington Village Hall SE794297, about one third of a mile along the road to the east, at the edge of Eastrington village. There is a large car park. East Riding Council will welcome our records and observations on the site.

The Area: Eastrington Ponds is a 23acre Local Nature Reserve, designated in 2002 and managed by East Riding Council. It comprises a disused railway track along which secondary woodland has developed, several ponds and a small meadow. There are access points to the waterside around the largest pond, which is used for fishing; the smaller ponds are largely undisturbed and surrounded by dense areas of reed-swamp, willow scrub and tall herb vegetation which are difficult to access except in a few small areas. One of the ponds has a *Sphagnum* bog growing on floating vegetation. Two adjacent grass fields are in Higher Level Stewardship, and we will have permission to access these. There is a well-maintained circular footpath around the site, with frequent benches.

The railway was the Hull to Barnsley line, which closed in 1959 and was used to transport coal to Hull Docks. The smaller wildlife ponds were 'borrow pits' which were excavated for the railway embankment, while the largest fishing pond lies on the site of the former Eastrington Brick Works.

There are Water Voles and Daubenton's Bats; Harvest Mouse has been recorded in the small meadow. Dave Chesmore has recorded Lepidoptera at the site for 10 years and has recorded more than 270 species. About 20 species of butterflies have been recorded, including Purple Hairstreak. If the weather is suitable, Dave will run a moth-trap on the evening before the Excursion and will go through it on the morning.

The last Excursion to the area was in June 1976. (*The Naturalist* (1976) 939: 137-8.)

East Riding website for Eastrington Ponds: http://www2.eastriding.gov.uk/leisure/countryside-and-walks/places-to-visit/local-nature-reserves/find-your-nearest-local-nature-reserves/?entryid87=101265

Circular No. 903

Divisional Secretary VC62: Anthony Wardhaugh 13 Captain Cook's Crescent, Marton, Middlesbrough TS7 8NN. Tel: 01642 322935 Email: tonyandmoirawardhaugh@bt.internet.com

The **VC62** meeting will be held at **Saltburn-by-the-Sea** on **Saturday 22 July 2017**.

Permission has been obtained from the Tees Valley Wildlife Trust for the YNU Moth Group to trap on the night of Friday 21 July in Saltburn Gill. Generators or batteries will be required because there is no power source available.

Maps: 1:50,000 Landranger Sheet: 94 Whitby.
1:25,000 Explorer Sheet: OL26 North York Moors Western Area.

Meeting Place: Meet at 10:30 at Cat Nab car park, Saltburn Bank, TS12 1NY (NZ6681.2152). There is a charge for parking. There is free parking near the top of the Saltburn Cliff Tramway on Marine Parade TS12 1DP (NZ6657.2162) but the area can be busy on summer weekends.

Reporting Meeting: Meet at Cat Nab car park, as above, at 16:30. No booking has been made for a meeting. Depending upon numbers attending we may use one of the local cafes.

The area: There are several sites which could be visited during the day. These include woodlands, dunes, a rocky shore and cliff-top grassland. There are three areas of ancient semi-natural Junewoodland nearby. Saltburn Gill Reserve (NZ674205, SSSI, owned by Tees Valley Wildlife Trust) includes some open areas as well as deciduous woodland. It is served by a public footpath running south-east from Cat Nab car park. The Wildlife Trust would welcome any records obtained during the field meeting and permission has been given for members to leave the public right of way in order to explore the reserve. Rifts Wood (NZ663207, owned by Redcar and Cleveland Council) lies south of the car park, beyond the Valley Gardens and is open to the public. Hazel Grove (NZ656215) is also council-owned and served by public footpaths. It is most easily accessed via a track running west from near the pier entrance and then a footpath entering at NZ6604.2165. Nearby, Saltburn Sands are backed by boulder clay and sand dunes. To the east of Cat Nab Car Park the Cleveland Way footpath passes along the cliff top to Hunt Cliff and Warsett Hill (NZ692214). The latter is an area of grassland and scrub. It is open access land and the site of a former Roman signal station. Saltburn Scar Rock shore lies below.

In the 1990s much survey work was carried out by the Cleveland Naturalists' Field Club and there are reports available at http://clevelandnats.org.uk section on Wildlife of the Area/Flora of the Teesside Area. These include extensive lists of flowering plants and bryophytes for the three woodlands described above and also details of a ground beetle survey carried out in 1993 in Saltburn Gill. Further details about Saltburn Gill and Hunt Cliff can be found at http://www.teeswildlife.org/nature-reserves/

Previous visits:
30.05.1887 Report: Naturalist 1887, vol. 12, pgs 217-224.
31.07.1915 Report: Naturalist 1915, vol. 40, pgs 334-337.
02.07.1932 Report: Naturalist 1932, vol. 57, pg. 346.
09.06.1962 Report: Naturalist 1962, vol. 87, pgs. 138-140.

Hazards of the area: Many of the footpaths in the Valley Gardens and Rifts Wood area are well maintained and provide easy access but some are quite steep and can be slippery in damp conditions. Saltburn Gill is served by a public footpath which can be soft and uneven in places. Some of the footpaths in Hazel Grove are similarly soft, uneven and steep in places. Great care is needed in all areas if leaving the footpaths as these woodlands lie in steep-sided valleys, often with a greasy clay soil or soft shale underfoot. Hunt Cliff is served by the Cleveland Way footpath from which there is a virtually sheer drop of approximately 100m on the seaward side. The rocky shore below Hunt Cliff is particularly slippery in areas where the rocks are covered in green algae and it is

possible to be cut off by the incoming tide to the east of the headland where the sea can rise well above the cliff base. The seaward side of the dunes to the west of Saltburn are steep and the sand deep, soft and mobile in places.

Circular No. 904

Divisional Secretary VC63: Joyce Simmons 16 Springfield Crescent, Kirk Smeaton, Pontefract, WF8 3LE Tel: 01977 620725 email: joyce@gentian.plus.com

The **VC63** excursion will be to **Dunford Bridge between Holmfirth and Penistone** on **Saturday 19 August 2017.**

Maps: 1:50,000 Landranger sheet: 110 Sheffield and Huddersfield
1:25,000 Explorer sheet: OL1 The Peak District, Dark Peak

Meeting Place: Meet in the Trans-Pennine Trail (TPT) car park at Dunford Bridge (SE158023) at 10.30. The A616 Holmfirth to Stocksbridge road crosses the B6106 Holmfirth to Penistone road at SE194035. From here, take the B6106 towards Holmfirth, then turn left on the minor road to Dunford Bridge. Park in the TPT car park. There are no toilet facilities at Dunford Bridge.

Reporting Meeting: In the Waggon and Horses, Langsett. This pub serves tea and coffee etc. and will stay open in the afternoon for our meeting at 16:00.

The area: Dunford Bridge is at an altitude of 335m near the dam of the Winscar Reservoir. The underlying rock here is millstone grit, with typical acid moorland vegetation. The moorland and conifer plantations are accessible from car parks beside the reservoir. The River Don was dammed to form the reservoir and flows from it alongside the Dunford Bridge meeting place. The Trans-Pennine Trail here follows the route of the railway which was closed in 1981. The broad margins of the trail, which is used by walkers and cyclists, are clothed in a variety of tree species and herbaceous plants. The wall alongside the trail is north-facing and particularly well clothed in bryophytes.

Wogden Foot, a small local nature reserve, lies 1.5km east of the car park, and is unusual in that it has a limestone suite of plants such as Marjoram *Origanum vulga*re. The land here was a siding on the railway where limestone ballast was deposited. The grassland is grazed to reduce scrub encroachment and there are a couple of shallow ponds.

This meeting has been planned as a joint excursion with Sorby Natural History Society, a very long-standing associate of the YNU. I am grateful to Roger Butterfield and Derek Whiteley for their help in planning this event.

Book Reviews

Changing Perceptions of Nature. Edited by **Ian Convery** & **Peter Davis**. 2016. pp324. HB: ISBN 9781783271054. RRP £60. The Boydell Press, Woodbridge.

Human perceptions of nature and the different ways in which these affect human-nature interactions are extremely varied, something that is reflected in the great diversity of material found in this volume. The book is a collection of essays divided into five broad themes, starting with *Historical Perceptions on Nature*, which range from the 16th century physician, William Turner, and his anthropocentric view of the universe, via the changing influences of religious belief and scientific method, to the present day concerns with conservation. The impact of key figures like Darwin, Wallace and David Attenborough are examined in relation to this. The section also considers the ways in which nature has been recorded, named and ordered by the likes of Aristotle and Linnaeus, culminating with an examination of modern issues of identification and taxonomic nomenclature.

The second section on *Collecting Nature* begins by considering the approach around the time of the Renaissance when collecting of live animals and plants was largely the preserve of the wealthy, mainly for use as status symbols to impress their contemporaries. It then goes on to consider the development of botanical gardens and herbaria, taxidermy, 19th century displays of specimens, eventually concluding with a chapter on the significance of museum collections for the 21st century. This last chapter uses as its case study Tullie House Museum, Carlisle, providing an outline of its history and the development of its role in the creation of what was, effectively, the first biological records centre (in 1902). The chapter concludes by examining current links between Tullie House with the local biodiversity data centre and natural history society.

Interpreting Nature and Landscapes, the third section, begins by examining the development of zoos and botanic gardens and their increasing importance for research, conservation, education and engaging the wider public. An illuminating chapter on changing perceptions of the English Lake District landscape is followed by several chapters considering very contemporary issues, amongst these: the growing disconnect between children and nature; perspectives on the modern visual media, in particular how they may be influencing people's feelings for nature.

Like the second section, the fourth, on *Conserving Nature*, is relatively short. It begins by considering the establishment of protected areas in the UK and, in particular, how motivations and approaches have changed from the beginning of the 20th century through to the present day. Illustrative examples are drawn from the north of England, specifically the Lake District and the north Pennines. The chapter following then focuses on the conservation of rare species and associated issues like the ethics of breeding in zoos and allowing species to go extinct because of lack of habitat. The history and value of the UK Wildlife Trusts movement is then outlined before the section concludes with a chapter on F.W. Champion, who campaigned in early 20th century India for protection of the tiger, largely by replacing the rifle with a camera.

The final section of the book on *People-Nature Interactions* is the largest one in terms of numbers of chapters and covers a wide range of issues, including nature and tourism, nature as therapy, citizen science, digital means of reconnecting dispersed museum collections of natural and cultural heritage with the communities from which they originate and, finally, re-wilding. The penultimate chapter on the evolutionary history of teddy bears sounds superficially very tongue-in-cheek but does make some serious points!

Considering the importance of religion on perceptions of nature over the past 400 years it is surprising that the book focuses almost exclusively on the Christian perspective and does not consider the influence of other religions in this field. Inevitably, in a book of this type (there are 38 authors), there are one or two of the 29 chapters that are highly specialised in their content and it could be argued that they tend to distract from the main themes. Nonetheless, overall, the grouping of the 29 chapters into 5 sections works reasonably well. The chapters are self-contained and short, making the book ideal for dipping into and, because of the breadth of the content, should provide something for anyone with an interest in the interactions between people and the natural world. The use of several examples from the north of England adds to its interest for members of the YNU.

AM

The Ague: A History of Indigenous Malaria in Cumbria and the North. By **Ian D. Hodkinson**. 2016. pp84. ISBN 9781873124741. RRP £8.50. Cumberland and Westmorland Antiquarian and Archaeological Society, Tract Series 26.

When I hear the word ‘ague’, it conjures up Dickens’ *Great Expectations*, with the violently shivering escaped convict Magwitch hiding in the Thames marshes: ”I think you have got the ague”, said I [Pip]... “It’s bad about here. You’ve been lying out on the meshes, and they’re dreadful aguish”. However, as this book ably shows, ague or marsh fever (what we now know as malaria), was widespread in Britain, responsible for significant and debilitating disease in both rural and urban populations extending to the North and even into Scotland. This short book written by Ian Hodkinson, a retired professional ecologist, conveniently collects together a wide range of historical records that tell the story of malaria in northern Britain, and especially in Cumbria.

After briefly running through the biology of malaria and noting the wide distribution of the six species of the genus *Anopheles* mosquito in the UK, we start upon what is the heart and value of this book. That is the drawing together in one convenient book of a widely scattered and disparate historical literature on the ague – much of this literature is highly localised, anecdotal and buried in diaries, letters, court records, parish records, petitions for Poor Law relief, horse passes, newspapers, handbills from travelling quack practitioners and stained glass windows to name just a few of the sources from which the book draws. A large portion of the book considers the incidence of ague in the rural and urban areas of Cumbria. The persistent presence of malaria for several hundred years in pockets of Cumbria is certainly well evidenced.

Though the endemic presence of malaria in Cumbria is the main focus of the book, there is also an interesting section looking at the importation of malaria, mainly from seasonal agricultural workers coming back from south-east England and other fenland hot spots. 'Horse passes' are invaluable here in documenting where labourers became too ill on the return journey and were given financial assistance to reach home. Other cases of malaria arose in workmen digging the Carlisle Canal (1821) who had previously visited Lincolnshire. More recently, troops returning from World War 1 led to the re-introduction of the protozoan parasite *Plasmodium vivax* into the mosquito population of southern England. Even today because of international tourism the importation of malaria cases is significant.

I particularly enjoyed the section on previous views of the cause of ague. It had long been known that ague was associated with damp environments such as marshes, swamps and other shallow bodies of water. The popular view held that the foul smells and will o' the wisps arising from the marshes, produced by decomposing vegetation, carried a disease-causing miasma – the word malaria is derived originally from Italian for *mal' aria* = *mala aria* or bad air. Distinctly odd local Cumbrian suggestions were that it was associated with the botling (Chub) fish's appearance in local streams. Others wondered if the poor diets of people forced to sustain themselves largely on potatoes might be the cause.

There is a fascinating section on local folk remedies. The shivering and shaking induced by the ague reminded some of the behaviour of those gripped by seizures as in epilepsy. Thus people reasoned that the same treatment should be applied to ague as epilepsy, which could include exorcism. A wide range of other treatments were deployed ranging from spells to charms and frights , but also the enlightened use of Peruvian bark from South American trees of the genus *Cinchona* (in powdered form known as Jesuits' or Devil's powder). If you were well-off you might visit various health-giving spa waters, such as Holy Well spring near Grange-over-Sands. One fascinating aside is that the benefits of these waters might have arisen from their iron-rich nature which helped alleviate the anaemia associated with ague. Indeed, there were reports of some people drinking the blood of their cattle for presumably a similar reason!

The final sections of the book cover the reasons for ague's decline and the possibility of it returning. Increasing agricultural drainage reduced the breeding opportunities for mosquitos, cattle were less likely to be overwintered in barns (which had provided a warm and plentiful blood source for overwintering mosquitos), the Victorian drive for sanitation infrastructure, better general health and nutrition in the population *et cetera* all had a cumulative effect. The book ends by discussing the possible threat of global warming in producing a partial re-introduction of ague because of increasing precipitation levels and higher mean temperatures. Though not discussed it would be interesting to consider whether the Zika virus might also be a possible fellow traveller with malaria to our shores?

Overall, I enjoyed this book. It represents a short treatment of an interesting story and concentrates in one source a wide range of historical sources relevant to ague in northern England (especially Cumbria).

DS

YNU Calendar 2017

Details are shown of events up to August. Up-to-date information and further details can be found at www.ynu.org.uk/events.

Apr	22	Botanical Section VC63 Field Meeting at Sandbeck Park nr Maltby. Meet at 10.30 at the south gate on the A634 (SK565894).
	30	Marine and Coastal Field Meeting Thornwick Bay, Flamborough. Meet in the grass car park next to the Headland Way signpost at 12.00 noon.
May	4	Entomological Section Field Meeting at Three Hagges Jubilee Wood, Escrick. Meet at the gate (SE627394) at 10.30.
	6	Joint meeting of the Conchological and Freshwater Ecology Sections. Jugger Howe Moor (SE940990). Meet at 11.00.
	6	Bryological Section Field Meeting at Arkengarthdale (VC65). Meet at 10.00 in the car park on the south side of Langthwaite (NZ005023).
	20	**VC64 Excursion to Beecroft Plantation and Thackray Beck, Timble (SE175538).** See p69.
	25	Entomological Section Field Meeting at Ingleborough Nature Reserve. Meet at Colt Park Barn (SD772777) at 10.30. See YNU website.
	27	Botanical Section Field Meeting at Carlton Marsh, Barnsley. Meet at 10.30 in the small car park on Shaw Lane (SE379103).
	28	Marine and Coastal Section Field Meeting at Filey Brigg (TA120814). Meet at 11.00 outside the Country Park Cafe.
Jun	1	Entomological Section Field Meeting at Three Hagges Jubilee Wood, Escrick. Meet at the gate (SE627394) at 10.30.
	10	**VC65 Excursion to Freeholder's and St John's Wood, Aysgarth (SE011887).** See p71.
	15	Entomological Section Field Meeting at Ingleborough Nature Reserve. Meet at Colt Park Barn (SD772777) at 10.30. See YNU website.
	24	Marine and Coastal Section Field Meeting to Red Acre Beach, Seaham. Meet at 8.30 on the beach slipway (NZ431495).
	25	Botanical Section Field Meeting to Fordon Bank. Meet at 10.00 at the crossroads in Fordon. A joint meeting with Ryedale Naturalists and Hull Natural History Soc.
	25	Seashore Bioblitz Boggle Hole. Meet in the car park on Bridge Holm Lane (NZ95240371) at 9.30.
Jul	6	Entomological Section Field Meeting at Three Hagges Jubilee Wood, Escrick. Meet at the gate (SE627394) at 10.30.
	8	**VC61 Excursion to Eastrington Ponds (SE786298).** See p73.
	13	Entomological Section Field Meeting at Ingleborough Nature Reserve. Meet at Colt Park Barn (SD772777) at 10.30. See YNU website.
	22	Marine and Coastal Section Field Meeting to Saltburn. Meet at 8.30 in Cat Nab car park (NZ668215).
	22	**VC62 Excursion to Saltburn-by-the-Sea (NZ668215).** See p74.
Aug	3	Entomological Section Field Meeting at Three Hagges Jubilee Wood, Escrick. Meet at the gate (SE627394) at 10.30.
	12	Botanical Section Field Meeting to the Leeds-Liverpool Canal. Meet at 10.30 in the car park off Canal Road, Kirkstall (SE27653404) at 10.30.
	19	**VC63 Excursion to Dunford Bridge (SE157024).** See p76.